

UNITED STATES COURT OF APPEALS
FOR THE TENTH CIRCUIT

STATE OF WYOMING,

Petitioner,

v.

No. 14-9529

UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY, et al.,

Respondents.

POWDER RIVER BASIN RESOURCE
COUNCIL; NATIONAL PARKS
CONSERVATION ASSOCIATION;
SIERRA CLUB; WYOMING OUTDOOR
COUNCIL; BASIN ELECTRIC POWER
COOPERATIVE; PACIFICORP;
AMERICAN COALITION FOR CLEAN
COAL ELECTRICITY; and ARCH COAL,
INC.,

Intervenors.

POWDER RIVER BASIN RESOURCE
COUNCIL, et al.,

Petitioners,

v.

No. 14-9530

UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY, et al.,

Respondents.

STATE OF WYOMING; BASIN
ELECTRIC POWER COOPERATIVE;
PACIFICORP; AMERICAN COALITION
FOR CLEAN COAL ELECTRICITY;
ARCH COAL, INC.; and IDAHO POWER
COMPANY,

Intervenors.

BASIN ELECTRIC POWER
COOPERATIVE,

Petitioner,

v.

UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY, et al.,

No. 14-9533

Respondents.

POWDER RIVER BASIN RESOURCE
COUNCIL; NATIONAL PARKS
CONSERVATION ASSOCIATION;
SIERRA CLUB; WYOMING OUTDOOR
COUNCIL; and PACIFICORP,

Intervenors.

PACIFICORP,

Petitioner,

v.

UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY, et al.,

No. 14-9534

Respondents.

POWDER RIVER BASIN RESOURCE
COUNCIL; NATIONAL PARKS
CONSERVATION ASSOCIATION;
SIERRA CLUB; WYOMING OUTDOOR
COUNCIL; and BASIN ELECTRIC
POWER COOPERATIVE,

Intervenors.

**CONSERVATION ORGANIZATIONS' OPPOSITION TO MOTION BY
THE STATE OF WYOMING, BASIN ELECTRIC POWER
COOPERATIVE, AND PACIFICORP TO ABATE PROCEEDINGS
PENDING SETTLEMENT PROCESS; REQUEST TO SCHEDULE ORAL
ARGUMENT IN CASE NOS. 14-9529, 14-9530, and 14-9534**

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INTRODUCTION

These consolidated cases were filed in 2014. Although they have been fully briefed for years, efforts by the Conservation Organizations¹ to proceed to oral argument and final resolution have been stymied because of protracted negotiations to settle just one among the many issues raised in the four consolidated petitions for review. Now, the State of Wyoming, Basin Electric Cooperative (“Basin”), and PacifiCorp (collectively, “Movants”) ask this Court to take the extraordinary step of further deferring resolution of the consolidated challenges to the Wyoming Haze Rule² until at least 2019—more than five years after they were filed.

Movants attempt to justify their request based on an illusory goal of “conserv[ing] the Court’s and parties’ resources” in light of a settlement agreement between Basin, Wyoming, and the U.S. Environmental Protection Agency (“EPA”) regarding one aspect of the Wyoming Haze Rule. Motion by the State of

¹ The term “Conservation Organizations” refers to Petitioners Powder River Basin Resource Council, National Parks Conservation Association, and Sierra Club in Powder River Basin Resource Council, et al. v. EPA, No. 14-9530, and Respondent-Intervenors Powder River Basin Resource Council, National Parks Conservation Association, Sierra Club, and Wyoming Outdoor Council in State of Wyoming v. EPA, No. 14-9529, Basin Electric Power Cooperative v. EPA, No. 14-9533, and PacifiCorp v. EPA, No. 14-9534.

² Final Rule, Approval, Disapproval and Promulgation of Implementation Plans; State of Wyoming; Regional Haze State Implementation Plan; Federal Implementation Plan for Regional Haze, 79 Fed. Reg. 5,032 (Jan. 30, 2014).

Wyoming, Basin Electric Power Cooperative, and PacifiCorp to Abate Proceedings Pending Settlement Process, at 2 (“Motion”). Such a stay, however, is unnecessary to the efficient resolution of these cases and would serve only to postpone life-saving pollution reductions that are also essential to improving visibility in our national parks and wilderness areas, and to deny the Conservation Organizations their right to proceed in Court with respect to their own claims and their defense of the challenged actions. The adage may seem trite, but it is apt in this case: “justice delayed is justice denied.”

Because Movants have not met their substantial burden to demonstrate that a stay should be granted, the Conservation Organizations respectfully request that the motion be denied and the petitions filed by the Conservation Organizations (No. 14-9530), PacifiCorp (No. 14-9534), and the portions of the Wyoming petition unaffected by the Settlement Agreement (No. 14-9529) be scheduled expeditiously for oral argument.

BACKGROUND

These consolidated cases all challenge aspects of the Wyoming Haze Rule, 79 Fed. Reg. at 5,032, which EPA promulgated to comply with the Clean Air Act’s requirement to reduce and eventually eliminate human-caused air pollution that impairs visibility in some of our nation’s most treasured public lands—national parks and wilderness areas. See 42 U.S.C. § 7491 (Clean Air Act regional haze

provisions). On March 28, 2014, the Conservation Organizations filed a petition for judicial review of certain aspects of the Wyoming Haze Rule. Specifically, the Conservation Organizations challenged (1) EPA's failure to include in the Wyoming Haze Rule incremental visibility-improvement goals and an estimate of the time that will be required to restore natural visibility conditions in affected federal lands under the Rule; (2) EPA's determination of the "best available retrofit technology," or "BART," for reducing nitrogen oxide pollution from Units 1 and 2 of the Naughton coal-fired power plant; and (3) EPA's failure to impose any requirements for reducing nitrogen oxide pollution from Wyoming's oil and gas production sector.

Basin Electric, PacifiCorp, and the State of Wyoming filed petitions for review challenging different aspects of EPA's Wyoming Haze Rule that disapproved Wyoming's BART determinations for reducing nitrogen oxide pollution from five coal-fired power plant units that are not involved in the Conservation Organizations' challenge—Laramie River Units 1-3, Wyodak Unit 1, and Dave Johnston Unit 3—and established more stringent emissions-reduction requirements for those units. Relevant to the Movants' instant request for a stay, Basin Electric was granted intervention in each of the three other petitions for review on April 28, 2014. See Order, Case No. 14-9529, Doc. 01019240976 (Apr. 28, 2014); Order, Case No. 14-3530, Doc. 01019240886 (Apr. 28, 2014); Order,

Case No. 14-9534, Doc. 01019240857 (Apr. 28, 2014). This Court procedurally consolidated these petitions for review with the Conservation Organizations' petition on May 15, 2014.

On September 9, 2014, the Court granted motions by Basin Electric, PacifiCorp, and Wyoming to stay the effectiveness of EPA's BART determinations for Laramie River 1-3, Wyodak 1, and Dave Johnston 3. Ord. on Mots. to Stay, Doc. 01019307361 (Sept. 9, 2014). As a result, the Wyoming Haze Rule's deadline for emissions reductions from these units was tolled for the period that these cases are pending. To date, however, the proceedings in the consolidated appeals have never been stayed by this Court.

Instead, these consolidated petitions have been fully briefed and awaiting oral argument since March 2015. However, around the time briefing was completed, Basin Electric and EPA commenced negotiations to settle the limited claims advanced in Basin Electric's petition for review, which concern EPA's BART determinations for Laramie River 1-3. See Motion, at 5 ("In March 2015, EPA and Basin Electric began discussions, through the Circuit Mediation Office, toward settlement of the issues regarding Basin Electric's Laramie River Units."). During the ensuing two-plus years, this case has been effectively (though not formally) held in abeyance. On September 10, 2015, the Circuit Mediation Office provided notice that oral argument would be set for January 2016. On December

7, 2015, the Circuit Mediation Office provided another notice that oral argument would be continued to March 2016.

Thereafter, having been advised by the Tenth Circuit Mediator that oral argument would likely be further delayed while negotiations between EPA and Basin Electric continued, the Conservation Organizations filed a motion to proceed separately with their own petition (Case No. 14-9530) and to have it retained on the March 2016 oral argument calendar. Conservation Orgs.’ Mot. to Proceed Separately, Doc. 01019540671 (Dec. 16, 2015). The Conservation Organizations’ motion observed that as a result of the settlement process, “oral argument in all four consolidated petitions for review has been postponed until at least March 2016, a full year following the completion of merits briefing, and the ongoing negotiations raise the prospect that oral argument and resolution of the Conservation Organizations’ petition for review may be further delayed.” Id. at 4.

In opposing the Conservation Organizations’ motion, EPA, Basin, PacifiCorp, and the State of Wyoming emphasized not only the inter-relatedness of the petitions, but also the likely short time to completion of the settlement negotiations and the need to re-brief the case in the event that a settlement between Basin and EPA were reached. EPA opposed the Conservation Organizations’ motion, claiming that, “if EPA and Basin Electric Power Cooperative (‘Basin Electric’) are able to resolve Basin Electric’s challenges to the Final Rule, judicial

economy would be served because the Court would not need to consider those challenges in order to resolve the petitions for review, nor would EPA need to defend against those challenges at argument.” EPA’s Opp., Doc. 01019550562, at 6 (Jan. 7, 2016). Further, “the Conservation Organizations will not be unfairly prejudiced by a short delay in scheduling a comprehensive argument” and “both parties [Basin and EPA] have been working diligently towards settlement.” Id. (emphasis added). Basin also opposed the Conservation Organizations’ motion, arguing that “an oral argument of some or all of this case at this time would disrupt those ongoing settlement efforts,” but expressing optimism that “a settlement might be achievable within the next three to six months.” Basin Elec. Power Coop.’s Resp. in Opp., Doc. 01019550545, at 2 (Jan. 7, 2016) (emphasis added). PacifiCorp’s opposition focused on the inconvenience it would allegedly suffer in sorting out arguments from the briefs in support of the industry petitioners on which it may want to rely in opposition to the Conservation Organizations’ petition, particularly because “PacifiCorp may need to ‘rebrief’ the BART issues if Basin Electric and EPA reach a compromise.” PacifiCorp’s Resp., Doc. 01019550574, at 10 (Jan. 7, 2016). PacifiCorp argued that it “should not be forced to ‘rebrief’ twice to appease the Conservation Organizations’ impatience over a few months delay.” Id. (emphasis added). Wyoming likewise claimed that the Conservation Organizations’ motion did not account for the fact that “Basin and

EPA may settle in the near future. At that point, Wyoming and PacifiCorp would need to reevaluate their arguments and briefs to determine whether revised briefing is necessary. ... But the parties will not know whether revised briefing is necessary until Basin and EPA conclude their discussions.” Wyo. Resp., Doc. 01019550552, at 6-7 (Jan. 7, 2016) (emphasis added).

The Court denied the Conservation Organization’s motion in a three-sentence order on January 13, 2016, Doc. 01019553173, and on February 4, 2016, the Circuit Mediation Office advised the parties that oral argument on all of the petitions would be further continued.

From the filing of the Conservation Organizations’ motion to proceed separately, more than 16 months passed before EPA finally notified this Court, on April 28, 2017, that a settlement had been reached. See Settlement Agreement, Doc. 01019802299 (filed April 28, 2017) (“Settlement Agreement”). The Settlement Agreement establishes a process that will last at least two years,³ and is expected to culminate in new BART determinations for Basin’s Laramie River Station (“LRS”) that would render Basin’s pending challenge to the Wyoming

³ The Settlement Agreement requires Wyoming to submit a revised State Implementation Plan to EPA within 12 months, Settlement Agreement, ¶ 9, requires EPA to publish a proposed rule in the Federal Register within 6 months thereafter, id. ¶ 5, and publish its final rule after another six months, id. ¶ 8. “The Parties may extend the dates set forth in this Settlement Agreement or otherwise modify this Settlement Agreement by a written agreement executed by counsel for the Parties.” Id. ¶ 15.

Haze Rule moot. The agreement addresses only the LRS BART determinations, and does not contemplate any changes to the remainder of the Wyoming Haze Rule separately challenged by other parties, including those challenged by the Conservation Organizations. *Id.* ¶ 5 (describing EPA’s agreement to proposed revisions to the Wyoming Haze Rule, which pertain only to Laramie River Station and not other aspects of the Rule).

Not satisfied with a stay of Basin’s petition and aspects of the Wyoming petition challenging the LRS BART determinations affected by the settlement, Movants seek to stay all cases challenging the Wyoming Haze Rule until the settlement is fully implemented—a process that encompasses a new federal rulemaking over a period of two years or more.

ARGUMENT

This Court should reject the extraordinary attempt by Basin, PacifiCorp and Wyoming to delay by two years or more the adjudication of cases that have already been before this Court for more than three years because the requested stay is unnecessary and inequitable.

I. STANDARD OF REVIEW

At the outset, Movants fail to provide this Court with the appropriate standard of review, which is based on the underlying principle “that ‘[t]he right to proceed in court should not be denied except under the most extreme circumstances.’” Commodity Futures Trading Comm’n v. Chilcott Portfolio Mgmt., Inc., 713 F.2d 1477, 1484 (10th Cir. 1983) (quoting Klein v. Adams & Peck, 436 F.2d 337, 339 (2d Cir. 1971)) (emphasis added).⁴ Consistent with that principle, this Court has recognized that where “a movant seeks relief that would delay court proceedings by other litigants he must make a strong showing of necessity because the relief would severely affect the rights of others.” Id. (emphasis added). This is true where an applicant for a stay seeks to prevent litigants in other cases from prosecuting their own cases, and also where an applicant seeks to stay its own case. Id.; see also Ben Ezra, Weinstein, & Co., Inc. v. Am. Online Inc., 206 F.3d 980, 987 (10th Cir. 2000) (affirming a district court’s denial of a plaintiff’s motion to stay proceedings to allow further discovery, noting that “[w]hen applying for a stay, a party must demonstrate ‘a clear case of hardship

⁴ In support of their request, Movants cite only the Court’s inherent authority to manage its docket. Motion, at 7 (citing TransAm Trucking, Inc. v. Fed. Motor Carrier Safety Admin., 808 F.3d 1205, 1208 (10th Cir. 2015)). However, TransAm Trucking, Inc. simply observed that the Court had granted a stay in its recital of the case’s procedural history, and does not discuss the Court’s “inherent authority” or set forth the appropriate standard of review.

or inequity’ if ‘even a fair possibility’ exists that the stay would damage another party”) (quotation omitted).

Here, Movants have failed to make the requisite “strong showing of necessity” for the requested stay. Commodity Futures Trading Comm’n, 713 F.2d at 1484. As described below, in “balancing the competing interests” of the litigants in these cases, id., the harm to the Conservation Organizations and the public interest substantially outweigh the illusory interests claimed by the Movants to support their motion.

II. THIS COURT’S PROCEDURAL CONSOLIDATION OF PETITIONS CHALLENGING THE WYOMING HAZE RULE DOES NOT REQUIRE ALL PETITIONS TO BE STAYED WHERE ONE IS SETTLED

Contrary to Movants’ suggestion, Motion, at 7-8, this Court’s procedural consolidation of the four petitions challenging various aspects of the Wyoming Haze Rule did not make all arguments advanced by all parties—regardless of which petition those arguments support or oppose—essential to this Court’s adjudication of every other petition for review. See, e.g., Harris v. Illinois-Cal. Exp., Inc., 687 F.2d 1361, 1368 (10th Cir. 1982) (“Consolidation of cases is permitted as a matter of convenience and economy” and “does not merge separate suits into one cause of action.”); Indep. Petroleum Ass’n of Am. v. Babbitt, 235 F.3d 588, 596 (D.C. Cir. 2001) (even where parties in consolidated cases “were represented by the same counsel and filed a joint brief on appeal, their individual

cases were not somehow merged into one—they remained separate and distinct”). While “convenience and economy” once favored consolidation of all petitions, Harris, 687 F.2d at 1368, the settlement of one of the petitions (and a segregable portion of another) renders continued consolidation of all petitions impracticable and—to the extent such consolidation would cause significant delay of judicial resolution of the non-settled petitions—inequitable.

III. THE PROPOSED STAY OF THE NON-SETTLED PETITIONS IS EXTRAORDINARY AND UNWARRANTED

Movants have failed to make any strong showing of necessity for their extraordinary request to stay four petitions for review because of the settlement of discrete claims asserted by only two of those petitions. In particular, Movants argue that adjudication of the non-settled claims while the Settlement Agreement is implemented would be inefficient, confusing to the parties and the Court, and unfair to Basin in the event that EPA fails to complete a new rule reconsidering the LRS BART determinations. Motion, at 12-15. The basis for all of Movants’ arguments is the overlapping nature of many of the legal issues raised by the petitions of Basin, PacifiCorp, and Wyoming, namely: “[t]he wide discretion afforded to the States in assessing BART;” “[t]he level of deference EPA must give to a State’s BART determination;” the role of the BART Guidelines; appropriate methods for addressing BART cost and visibility factors; EPA’s consideration of “pre-existing pollution controls;” and “inconsistencies in EPA’s

treatment of BART at different facilities.” Id. at 8-10.⁵ However, as described below, the circumstances described by Movants are those inherent in any litigation and do not constitute “the most extreme circumstances” that could justify Movants’ claim for an extraordinary stay. Commodity Futures Trading Comm’n, 713 F.2d at 1484.

A. Adjudication of the Non-Settled Claims Will Not Lead to Inefficiency or Confusion

Movants overstate the efficiency benefits of the requested stay, which are minimal, at best. Movants’ claim of efficiency is that a stay would obviate this Court’s need to “hear argument and decide some aspects of the case . . . , while potentially having to hear a second argument and render a second decision on very similar legal issues if the settlement falls through.” Motion, at 12. However, judicial economy “considerations should rarely if ever lead to such broad curtailment of the access to the courts.” Commodity Futures Trading Comm’n, 713 F.2d at 1485.

Moreover, the circumstance that Movants reference—where EPA abandons any rulemaking and retains the current LRS BART determinations that EPA already elected not to defend before this Court—is the least likely outcome of the

⁵ Movants do not cite any overlap in the challenged BART determinations because there are none, where BART determinations involve a source-specific analysis. See 40 C.F.R. § 51.308(e)(1)(ii)(A) (describing BART analysis); 40 C.F.R. pt. 51, App. Y (EPA guidelines for source-specific BART determinations).

settlement process. Notably, any reconsidered BART determinations—not only the final pollution controls and emissions limitations specifically identified in the settlement—would render Basin’s present petition for review moot. If EPA were to finalize emission limits for LRS that differed from those contemplated by the settlement in a manner Basin opposed, Basin could not simply revive its challenge of the prior LRS BART determinations, but would be required to file a new petition for review of the Final Rule containing the revised determinations. See 42 U.S.C. § 7607(d)(7) (limiting judicial review to evidence in the administrative record and objections “raised with reasonable specificity” during the public comment period); see also Banner Health v. Burwell, 126 F. Supp. 3d 28, 70 (D.D.C. 2015) (stating that “decisions made earlier can be challenged based on information before the agency at the time of a later rulemaking only if the later rulemaking actually considered and adopted, anew, the results of the earlier rulemaking”). While Movants are correct that the Conservation Organizations have advocated for EPA to maintain the LRS BART determinations in the current Wyoming Haze Plan rather than settle with Basin, Motion, at 14, to date, the Conservation Organizations have been unable to persuade EPA to do so. Without evidence that EPA will have a sudden change of heart, any potential efficiency benefits of delaying adjudication of all challenges to the Wyoming Haze Plan are speculative and remote.

Movants also overstate the “confusion” to the Court and the parties if the Basin petition were severed and—in the event EPA fails to fully implement the settlement and Basin revives its case—argued at a later time. As an initial matter, there is no reason for confusion about “which issues are before the Court” under the terms of the Settlement Agreement. Motion, at 13. The agreement is clear that “[a]spects of the Final Rule affecting Basin Electric that are not directly implicated by the terms of this Settlement Agreement (including, without limitation, other emissions limits, recordkeeping, and other requirements) shall not be altered in EPA’s proposed rulemaking.” Settlement Agreement, ¶ 6. To the extent that there are overarching legal issues raised in Basin’s briefing that “the Court must resolve ... in the course of deciding issues specific to PacifiCorp and Wyoming,” Motion, at 13, PacifiCorp and Wyoming may incorporate such issues in re-briefing their own cases to ensure they are properly before the Court.

Indeed, Wyoming and PacifiCorp already forecasted the need for such re-briefing in justifying their opposition to the Conservation Organizations’ motion to proceed separately, arguing that having to re-brief the case “twice”—once to accommodate segregation of the Conservation Organization’s petition and again to accommodate any settlement between Basin and EPA—would be overly burdensome. Wyo. Mot. Resp., Doc. 01019550552, at 1, 7; PacifiCorp Mot. Resp., Doc. 01019550574, at 10. Now, however, having invoked the eventual need for

re-briefing to defeat the Conservation Organizations’ motion to proceed separately, PacifiCorp and Wyoming apparently seek to avoid even the single re-briefing process that they previously acknowledged would be necessary. PacifiCorp and Wyoming’s shifting position on the practicality of re-briefing to accommodate settlement between Basin and EPA cannot carry the day here because any inconvenience to PacifiCorp and Wyoming does not constitute “a clear case of hardship or inequity” as required to justify Movants’ position. Ben Ezra, Weinstein, & Co., Inc., 206 F.3d at 987. Further, in the likely event that EPA follows through with the settlement it negotiated, the claims of PacifiCorp and Wyoming would remain at issue, and the alleged inconvenience of re-briefing would persist. Where “suits are thus merely being delayed, but not obviated” by virtue of a stay, “the conservation of judicial efforts by delaying ... suits will likely be negligible.” Commodity Futures Trading Comm’n, 713 F.2d at 1485.

Additionally, Movants provide no argument at all for why inefficiency or confusion would result from proceeding with the Conservation Organizations’ petition, where the Conservation Organizations’ briefs in support of their petition address only their challenges to the Wyoming Haze Rule and do not cross-reference any briefing in support of the state or industry petitions, and the

intervenor-response briefs filed by PacifiCorp and the State of Wyoming,⁶ as well as the amicus briefs filed by the American Petroleum Institute and the Petroleum Association of Wyoming, likewise address only the claims raised in the Conservation Organizations' petition. While EPA's response brief addresses the claims advanced in all four petitions for review, the portions of EPA's brief that respond to the Conservation Organizations' claims are discrete and readily segregable from EPA's other arguments.

In sum, Movants' claims that a stay is warranted to avoid inefficiency and confusion do not constitute a "strong showing of necessity" for the extraordinary process they seek. Commodity Futures Trading Comm'n, 713 F.2d at 1484.

B. Adjudication of the Non-Settled Claims Will Not Be Unfair to Basin

Movants' argument that adjudicating the non-settled claims would unfairly harm Basin's interests should also be rejected. Movants' position is again based on the remote potential that EPA will abandon the rulemaking contemplated by the Settlement Agreement and Basin would find it necessary to revive its challenge to the Wyoming Haze Rule before this Court. Movants claim that Basin would be harmed if this Court had already "resolved the common legal issues in the other appeals." Motion, at 15. In other words, having obtained the benefit of an out-of-

⁶ Respondent-Intervenor Basin Electric did not file a response brief in opposition to the Conservation Organizations' petition for review.

court settlement, Basin wishes to give up none of the potential future benefits of actually arguing its case before this Court, in the very unlikely event that such argument should become necessary. But the extraordinary action that Movants seek is unwarranted and entirely unnecessary to protect Basin's interests in this litigation. The Court should not countenance Basin's effort to have its cake and eat it too—all at the expense of public health and improved air quality in our treasured public lands.

Movants' claim of prejudice to Basin is wrong for a number of reasons. First, as briefed by the Conservation Organizations on the merits, this Court has already adjudicated most of the legal issues identified by Movants in the context of challenges to EPA's regional haze plans for other states. See Final Brief of Respondent-Intervenors, Doc. 01019398238, at 6-9 (Mar. 13, 2017) (discussing standard of review, citing Oklahoma v. U.S. E.P.A., 723 F.3d 1201, 1211 (10th Cir. 2013), cert. denied 134 S.Ct. 2662 (2014)); id. at 10-12 (discussing argument that EPA owes deference to State BART determinations, citing Oklahoma, 723 F.3d at 1204); id. at 25-28 (discussing role of BART Guidelines, citing Oklahoma, 723 F.3d at 1209); id. at 28-29 (discussing cost methods, citing Oklahoma, 723 F.3d at 1213). This Court's resolution of the same legal issues in the context of the PacifiCorp and Wyoming petitions would simply add to this precedential backdrop. Precedent is not prejudice.

Perhaps more fundamentally, regardless of the settlement and requested stay of Basin's own petition for review, Basin is entitled to argue its position on the legal issues in all of the remaining petitions by virtue of its intervenor status. See supra, Background. Movants' claim that Basin's role as an intervenor is necessarily "more limited" because it will have "less words in briefing, no time at oral argument, and less of a say in how the issues are presented" is baseless. Motion, at 15. Because Basin is a Petitioner-Intervenor in Wyoming and PacifiCorp's petitions, and a Respondent-Intervenor in the Conservation Organizations' petition, Basin is "a full participant in the [petitions] and is treated just as if it were an original party." Alvarado v. J.C. Penney Co., 997 F.2d 803, 805 (10th Cir. 1993) (quoting Schneider v. Dumbarton Developers, Inc., 767 F.2d 1007, 1017 (D.C. Cir. 1985)).

Further, contrary to Movants' claim, any impact on the Settlement Agreement due to this Court's resolution of the remaining petitions is not "particularly unfair to Basin Electric" and does not support the requested stay. Motion, at 14. As Movants observe, "[t]he conclusion of the settlement process now lies primarily in the hands of EPA." Id. That is the deal Basin bargained for in return for EPA's reconsideration of the LRS BART determinations. As a matter of law, it could not be any other way, because EPA is prohibited from entering into a Settlement Agreement that commits to a particular outcome of its rulemaking

process. See 5 U.S.C. § 553 (establishing administrative rulemaking process); Nat. Res. Def. Council, Inc. v. U.S. E.P.A., 859 F.2d 156, 194 (D.C. Cir. 1988) (“[A] binding promise to promulgate in the proposed form would seem to defeat Congress’s evident intention that agencies proceeding by informal rulemaking should maintain minds open to whatever insights the comments produced by notice under § 553 may generate.”). Such uncertainty is not caused by this Court’s adjudication of overarching legal issues respecting the regional haze program; it is inherent in any lawful rulemaking process.

IV. FURTHER DELAY IN RESOLVING THE CONSOLIDATED PETITIONS HARMS THE CONSERVATION ORGANIZATIONS AND THE PUBLIC INTEREST

The extraordinary additional delay advocated by Movants is not only unwarranted, it would inequitably subject the Conservation Organizations’ members to excessive nitrogen oxide pollution that impairs visibility in the spectacular public lands affected by the Wyoming Haze Rule and harms public health in Wyoming, while denying the Conservation Organizations an opportunity to advance their claims before this Court that seek to remedy that injury. See Declarations filed with Petitioners’ Unopposed Motion to Intervene, Doc. 01019239219 (April 24, 2014); Declarations filed with Petitioners’ Opening Brief, Doc. 01019297008 (Aug. 18, 2014). Because the State and industry petitioners have secured a stay of the pollution-reduction requirements they challenged, only

the Conservation Organizations and the public interest have been prejudiced by the substantial delay to date in resolving the litigation, and only the Conservation Organizations and members of the public would be harmed by further delay. The Court should not sanction this inequitable result. See Rohr Indus., Inc. v. Washington Metro. Area Transit Auth., 720 F.2d 1319, 1326 (D.C. Cir. 1983) (“Courts must be on guard to prevent ‘the ossification of rights which attends inordinate delay.’”) (quoting Hines v. D’Artois, 531 F.2d 726, 737 (5th Cir. 1976)).

First, this Court should reject Movants’ requested two-year delay of cases that have already been pending on this Court’s docket for three years because it would effectively deny the Conservation Organizations’ “right to proceed in court” in both their challenges to and defenses of the Wyoming Haze Rule. Commodity Futures Trading Comm’n, 713 F.2d at 1484 (quotation omitted).

Second, the requested stay also would harm the public interest because it would result in further delay of pollution reductions required by the Wyoming Haze Plan that would benefit human health, in addition to visibility and ecosystems in national parks and wilderness areas. The Wyoming Haze Rule requires nitrogen oxide (“NO_x”) emissions reductions of 1,596 tons per year (“tpy”) from Dave Johnston Unit 3 and 2,496 tpy from Wyodak. 79 Fed. Reg. at 5,042, 5,044 (calculated by subtracting emissions under the “New LNBs with OFA” scenario,

which reflects existing controls, from emissions under the “New LNBs with OFA and SCR,” which reflects the final BART determinations).⁷ As documented in the attached Declaration of Dr. George Thurston,⁸ NO_x pollution and secondarily formed particulate matter (“PM”) cause lung damage; respiratory illness; increased emergency department visits and hospitalizations; and increased risk of heart attacks, lung cancer, and mortality. Exhibit A, Thurston Decl. ¶¶ 11-13, 15-16, 26.⁹ There is no safe exposure level for these pollutants, *id.* ¶¶ 20, 27; thus, “even in places where background air is relatively clean, small changes in air pollution concentration can have population health impacts,” *id.* ¶ 20 (emphasis original). Indeed, for “those with pre-existing respiratory and cardiac disease, infants and children, and the elderly,” delaying the emissions reductions challenged by the PacifiCorp and Wyoming petitions—even by two years—may lead to premature death. *Id.* ¶¶ 35, 37.

⁷ Requirements to better control emissions from Naughton Units 1 and 2 and the oil and gas sector, as urged in the Conservation Organizations’ petition, would add to these significant pollution-reduction benefits. See Conservation Organizations’ Final Opening Brief, Doc. 01019398200, at 33-34, 49-51 (Mar. 13, 2015).

⁸ The Conservation Organizations first filed Dr. Thurston’s declaration with this Court in connection with their opposition to Basin, PacifiCorp, and Wyoming’s motions to stay the effective date of emissions-reduction requirements in the Wyoming Haze Plan. Doc. 01019278265 (July 14, 2014).

⁹ The NO_x BART controls at issue will reduce ambient concentrations of both NO_x and PM 2.5—a subset of PM including fine inhalable particles smaller than 2.5 micrometers in diameter—because gaseous NO_x emitted from power-plant smokestacks is chemically converted to PM 2.5 in the atmosphere. Thurston Decl. ¶ 11 and n.1.

Further, the requested delay would postpone visibility improvement in prized public lands, such as Wind Cave, Badlands, and Rocky Mountain national parks, see 79 Fed. Reg. at 5,042, 5,044, thus depriving visitors of miles of views and the experience of enjoying these spectacular landscapes unmarred by haze. This evidence refutes Movants' unsupported assertions that a stay would not harm the Conservation Organizations and demonstrates that a stay is not in the public interest.

While ignoring these substantial public health and environmental impacts, Movants make the extraordinary claim that the Conservation Organizations will not be harmed by two additional years of delay—on top of the two years of delay already occasioned by the settlement negotiations between EPA and Basin—because, “[w]hile the settlement process has been long and complicated, and the final administrative processes will take several more months,” BART determinations themselves are complex and take time. Motion, at 15-16. Movants' position seems to be that, in light of the very long time it typically takes—and has taken in the case of Wyoming—to secure statutorily mandated emissions reductions, a few additional years is a “drop in the bucket.” But the length of time it has taken EPA to finalize life-saving emissions reductions that are also necessary to improve visibility in treasured public landscapes is a reason to finally resolve these cases, not to further delay them.

CONCLUSION

To ensure that the Conservation Organizations and the public interest do not continue to be harmed by the delay in resolving these challenges, this Court should deny the Movants' extraordinary stay motion and expeditiously schedule the petitions filed by the Conservation Organizations (No. 14-9530), PacifiCorp (No. 14-9534), and the non-settled portions of the Wyoming petition (No. 14-9529) for oral argument.

Respectfully submitted this 11th day of May, 2017,

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CERTIFICATION FOR ECF PLEADING

I hereby certify with respect to the foregoing that all required privacy redactions have been made; that if required to file hard copies with the clerk's office, the ECF submission is an exact copy of those documents; and that the ECF submission was scanned for viruses with the most recent version of a commercial virus scanning program and according to the program is free of viruses.

Respectfully submitted May 11, 2017.

s/ Jenny K. Harbine

CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME LIMITATION

As required by Fed. R. App. P. 32(a)(7)(C), I certify that this brief is proportionally spaced and contains 5,180 words, which complies with the limit of 5,200 words for response briefs in Fed. R. App. P. 27(d)(2)(A). I relied on my Microsoft Word word processing tool to obtain the count.

I certify that the information in this certificate is true and correct to the best of my knowledge and belief formed after a reasonable inquiry.

Respectfully submitted May 11, 2017.

s/ Jenny K. Harbine

CERTIFICATE OF SERVICE

I certify that on this 11th day of May, 2017, I electronically filed the foregoing OPPOSITION TO MOTION BY THE STATE OF WYOMING, BASIN ELECTRIC POWER COOPERATIVE, AND PACIFICORP TO ABATE PROCEEDINGS PENDING SETTLEMENT PROCESS; REQUEST TO SCHEDULE ORAL ARGUMENT with the Clerk of the Court for the United States Court of Appeals for the Tenth Circuit by using the appellate CM/ECF system, which will send notification of this filing to all attorneys of record.

s/ Jenny K. Harbine

Exhibit A

UNITED STATES COURT OF APPEALS
FOR THE TENTH CIRCUIT

STATE OF WYOMING,

Petitioner,

v.

No. 14-9529

UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY, et al.,

Respondents.

POWDER RIVER BASIN RESOURCE
COUNCIL; NATIONAL PARKS
CONSERVATION ASSOCIATION;
SIERRA CLUB; WYOMING OUTDOOR
COUNCIL; BASIN ELECTRIC POWER
COOPERATIVE; PACIFICORP;
AMERICAN COALITION FOR CLEAN
COAL ELECTRICITY; and ARCH COAL,
INC.,

Intervenors.

POWDER RIVER BASIN RESOURCE
COUNCIL, et al.,

Petitioners,

v.

No. 14-9530

UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY, et al.,

Respondents.

STATE OF WYOMING; BASIN
ELECTRIC POWER COOPERATIVE;
PACIFICORP; AMERICAN COALITION
FOR CLEAN COAL ELECTRICITY;
ARCH COAL, INC.; and IDAHO POWER
COMPANY,

Intervenors.

BASIN ELECTRIC POWER
COOPERATIVE,

Petitioner,

v.

No. 14-9533

UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY, et al.,

Respondents.

POWDER RIVER BASIN RESOURCE
COUNCIL; NATIONAL PARKS
CONSERVATION ASSOCIATION;
SIERRA CLUB; WYOMING OUTDOOR
COUNCIL; and PACIFICORP,

Intervenors.

PACIFICORP,

Petitioner,

v.

No. 14-9534

UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY, et al.,

Respondents.

POWDER RIVER BASIN RESOURCE
COUNCIL; NATIONAL PARKS
CONSERVATION ASSOCIATION;
SIERRA CLUB; WYOMING OUTDOOR
COUNCIL; and BASIN ELECTRIC
POWER COOPERATIVE,

Intervenors.

DECLARATION OF DR. GEORGE D. THURSTON
IN OPPOSITION TO MOTIONS TO STAY

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I, George D. Thurston, declare and state as follows:

1. My name is George D. Thurston, and I am a Professor of Environmental Medicine at the New York University (“NYU”) School of Medicine. I am over the age of 18 years and I am competent to testify concerning the matters in this declaration.

2. I have a Bachelor of Science degree in Engineering from Brown University, and a Masters and Doctorate of Environmental Health Sciences from the Harvard University School of Public Health. I have over 25 years of subsequent experience in the evaluation of the human health effects of air pollution. From 2007 through 2010, I served on the U.S. Environmental Protection Agency’s Clean Air Scientific Committee (“CASAC”) that advises the EPA on the promulgation of ambient air quality standards. I have also served as the Chairman of the Health and Environment Impact Assessment Panel that conducted the “Joint Industry/Government Study of Sulphur in Gasoline and Diesel Fuels” health benefits and valuation analysis for the Canadian Government in 1997. I have published extensively regarding the health effects of inhaled air pollutants on humans, particularly as it relates to asthma attacks, hospital admissions, and mortality, in prominent scientific journals, such as Science, Lancet, Thorax, and The Journal of the American Medical Association (“JAMA”). I have also been called upon by both the U.S. House of Representatives and the U.S.

Senate on multiple occasions in recent years to provide testimony before them regarding the human health effects of air pollution, most recently on October 10, 2011. A statement of my qualifications is attached to my affidavit as Exhibit A.

3. The publications reviewed or relied upon for this declaration are listed at the end of this report as "Literature Cited." Within the last 4 years, I have provided expert testimony at trial or in deposition in the following matters: Sierra Club vs. Energy Future Holdings Corporation And Luminant Generation Company LLC, Civil Action No. 6:12-cv-00108-WSS; Katie Lowery et al. v. Honeywell International Inc. et al., 01-Cv-2005-001749.00 (Circuit Court of Jefferson County, Alabama); Oklahoma, Oklahoma Industrial Energy Consumers, and Oklahoma Gas and Electric Company v. United States Environmental Protection Agency, and Lisa P. Jackson, Administrator, Consolidated Case Nos. 12-9526 and 12-9527 (10th Cir. Court of Appeals); Sierra Club v. Energy Future Holdings Corporation and Luminant Generation Company (E.D. Texas, Texarkana Division), Civil Action No. 5:10-Cv-00156; Public Service Company of New Mexico v. United States Environmental Protection Agency and Lisa Jackson, Administrator, United States Environmental Protection Agency Case No. 11-9557 (10th Cir. Court of Appeals); Sierra Club, Kentucky Environmental Foundation & Kentuckians for the Commonwealth v. Energy and Environment Cabinet and East

Kentucky Power Cooperative, Commonwealth of Kentucky Environmental and Public Protection Cabinet File No. DAQ-41109-048.

4. This declaration is submitted in opposition to the motions by the State of Wyoming, PacifiCorp, and Basin Electric Power Cooperative for a stay of the effective date of portions of the EPA's Wyoming Regional Haze rule (State of Wyoming; Regional Haze State Implementation Plan; Federal Implementation Plan for Regional Haze, in EPA Docket No. EPA-R08-OAR-2012-0026, FRL9905-42-R08, hereinafter "FIP"). The FIP includes a determination of best available retrofit technology ("BART") for the Laramie River Station Units 1-3, Dave Johnston Unit 3, and Wyodak generating station, which will require the installation of selective catalytic reduction ("SCR") at these units.

5. The purpose of this declaration is to document the adverse human health effects that are associated with exposures to air pollutants from coal-fired power plants generally. In this report, I also document the specific adverse health effects to be expected from the excess emissions of the nitrogen oxides and fine particulate matter that would result from delayed implementation of the FIP at the Laramie River Station Units 1-3, Dave Johnston Unit 3, and Wyodak generating station.

6. To summarize the analysis described in more detail below, I conclude that the Laramie River Station Units 1-3, Dave Johnston Unit 3, and Wyodak generating

station units contribute to the serious and well-documented adverse human health effects known to be associated with exposure to air pollution from coal-fired power plants in general. The documentation and analysis I used to arrive at this conclusion include both epidemiological and toxicological evidence that I and others have published in the medical and scientific literature. In conducting this analysis, I also relied upon other expert reports submitted in this case on behalf of Petitioners, namely the report of Mr. D. Howard Gebhart. Applying this information to the U.S. EPA approved Environmental Benefits Mapping and Analysis Program (“BenMAP”) model (Abt Associates, 2010), I then calculated the excess human health impacts that would occur each year if a stay of effective date of FIP implementation were to be allowed, as well as the annual economic valuation of those unavoids health impacts.

HEALTH IMPACTS FROM POWER PLANTS LIKE THOSE AT ISSUE IN THIS CASE

7. The adverse health consequences of breathing air pollution from industrial sources such as coal-fired power plants are well documented in the published medical and scientific literature. During the past few decades, medical research examining air pollution and public health has shown that air pollution is associated with a host of serious adverse human health effects. This documentation includes impacts revealed by observational epidemiology, and confirmed by controlled chamber exposures,

showing consistent associations between air pollution and adverse impacts across a wide range of human health outcomes.

8. Observational epidemiological studies provide the most compelling and consistent evidence of the adverse effects of air pollution from industrial sources such as coal-fired power plants. The literal definition of “epidemiology” is “the study of epidemics.” In academic and public health circles, however, this field of study includes all statistical investigations of human health and potentially causal factors of good or ill health. In the case of air pollution, such studies follow people as they undergo varying real-life exposures to pollution over time, or from one place to another, and then statistically compare the health impacts that occur in these populations when higher (versus lower) exposures to pollution are experienced. In such studies, risks are often reported in terms of a Relative Risk (“RR”) of illness, wherein a $RR = 1.0$ is an indication of no change in risk after exposure, while a $RR > 1.0$ indicates an increase in health problems after pollution exposure, and that air pollution is damaging to health.

9. These epidemiological investigations are of two types: (a) population-based studies, in which an entire city's population might be considered in the analysis; and (b) cohort studies, in which selected individuals, such as a group of asthmatics, are considered. Both types of epidemiologic studies have shown confirmatory

associations between air pollution exposures and increasing numbers of adverse impacts, including:

- ∞ decreased lung function (a measure of our ability to breathe freely);
- ∞ more frequent asthma symptoms;
- ∞ increased numbers of asthma and heart attacks;
- ∞ more frequent emergency department visits;
- ∞ additional hospital admissions; and
- ∞ increased numbers of daily deaths.

10. As discussed by A.B. Hill (1965) in his seminal paper on epidemiology and causality, the fact that the effects of air pollution have been shown so consistently for so many health endpoints and in so many locales indicates that these associations, summarized above, are causal.

11. Particulate Matter (“PM”) is among the key air pollutants caused by power plant emissions that have been revealed by research to adversely affect human health. These research studies have been conducted for a wide array of geographic areas. PM_{2.5}¹ air pollution has been carefully studied in the past decade. PM is composed of two major components: (a) “primary” particles, or soot, emitted directly into the

¹ PM_{2.5} is a subset of PM that includes fine inhalable particles smaller than 2.5 micrometers in aerodynamic diameter.

atmosphere by pollution sources; and (b) “secondary” particulate matter, formed in the atmosphere from gaseous pollutants, such as the sulfur oxides (“SOx”) and nitrogen oxides (“NOx”) that are also emitted by coal-fired power plants. After formation in the atmosphere, this secondary PM largely condenses upon the smallest existing primary particles that, collectively, represent the greatest surface area for the secondary PM to condense upon. These secondary particles are very small, commonly having an aerodynamic diameter of less than 1.0 micrometer (μm) – a fraction of the diameter of a human hair. For example, after it is released from a smokestack, gaseous NOx is chemically converted in the atmosphere to become nitrate PM_{2.5}.

12. In addition to lung damage, recent epidemiological and toxicological studies of PM air pollution have shown adverse effects on the heart, including an increased risk of heart attacks. For example, when PM stresses the lung (*e.g.*, by inducing fluid in the lungs, as edema), it places extra burden on the heart, which can induce fatal complications for persons with cardiac problems. For example, Peters *et al.* (2001) found that exposure to elevated concentrations of fine particles in the air can elevate the risk of Myocardial Infarction (“MI” or heart attack) within a few hours, and extending 1 day after PM exposure. The Harvard University team found that a 48% increase in the risk of MI was associated with an increase of 25 $\mu\text{g}/\text{m}^3$ PM_{2.5} during a

2-hour period before the onset of MI, and a 69% increase in risk to be related to an increase of 20 ug/m^3 $\text{PM}_{2.5}$ in the 24-hour average 1 day before the MI onset (Peters *et al.*, 2001). Similarly, Ito et al (2011) found that daily hospital admissions and mortality due to MI and cardiovascular disease (CVD) increased following $\text{PM}_{2.5}$ exposure, as did Bell et al. (2008) for CVD hospital admissions among older adults across the U.S.

13. Epidemiologic research conducted on U.S. residents has indicated that acute exposure to PM air pollution is associated with increased risk of mortality. A recent nationwide time-series statistical analysis by the Health Effects Institute (“HEI,” 2003) of mortality and PM_{10} ² air pollution in 90 cities across the US indicates that, for each increase of 10 ug/m^3 in daily PM_{10} air pollution concentration, there is an associated increase of approximately 0.3% in the daily risk of death.

14. While a 0.3% change in the daily death risk may seem small, it is important to realize that such added risks apply to the entire population, and accumulate day after day, week after week, month after month, and year after year, until they account for thousands of needless daily deaths from air pollution in the U.S. each year.

² PM_{10} is a subset of PM that includes inhalable particles that are smaller than 10 micrometers in aerodynamic diameter.

15. In addition to the acute health effects associated with daily PM pollution, long-term exposure to fine PM is also associated with increased lifetime risk of death, and has been estimated to take years from the life expectancy of people living in the most polluted cities, relative to those living in cleaner cities. For example, in the Six-Cities Study (that was a key basis for the setting of the original PM_{2.5} annual standard in 1997), Dockery *et al.* (1993) analyzed survival probabilities among 8,111 adults living in six cities in the central and eastern portions of the United States during the 1970's and 80's. The cities were: Portage, WI (P); Topeka, KS (T); a section of St. Louis, MO (L); Steubenville, OH (S); Watertown, MA (M); and Kingston-Harriman, TN (H). Air quality was averaged over the period of study in order to study long-term (chronic) effects. As shown in Figure 1, it was found that the long-term risk of death, relative to the cleanest city, increased with fine particle exposure, even after correcting for potentially confounding factors such as age, sex, race, smoking, etc.

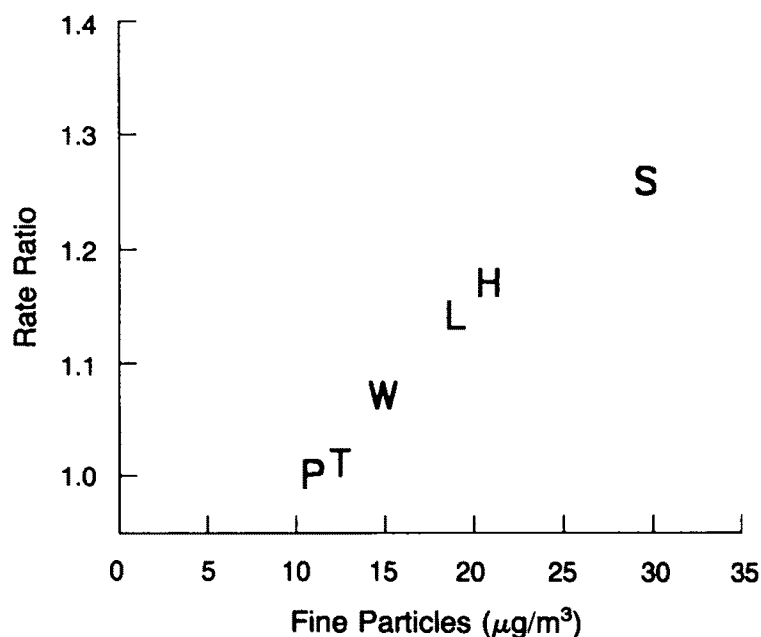


Figure 1. The Harvard Six-Cities Study showed that the lifetime risk of death increased across 6 U.S. cities as the average fine PM levels increased, with the highest risk in Steubenville, Ohio (S), located in Jefferson County, Ohio. (Source: Dockery *et al.*, 1993.)

16. Subsequently, a manuscript that I wrote with co-authors, and published in JAMA, shows that long-term exposure to combustion-related fine particulate air pollution is an important environmental risk factor for cardiopulmonary and lung cancer mortality. Indeed, this study indicates that the increase in risk of lung cancer from long-term exposure to $\text{PM}_{2.5}$ in a city like New York is roughly the same as the increase in lung cancer risk of a non-smoker who breathes passive smoke while living with a smoker, which is about a 20% increase in lung cancer risk (see Pope, CA *et al.*, 2002).

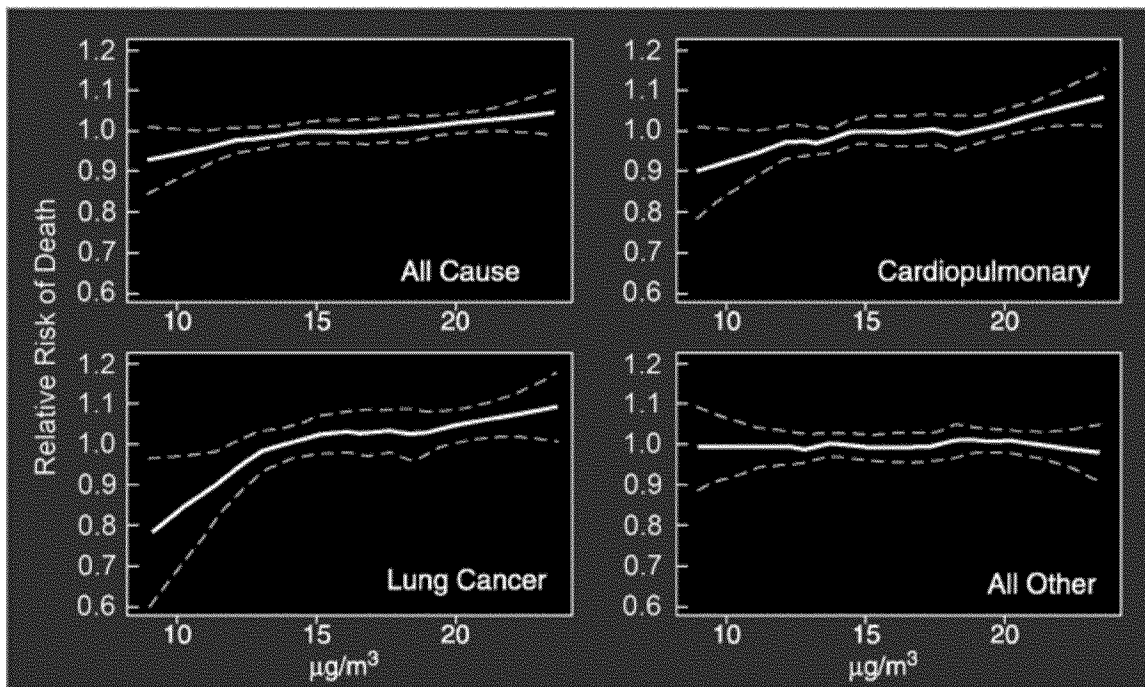


Figure 2. Cardiac, Lung, and Cancer Mortality Risks Increase Monotonically with Exposure to Long-Term Fine PM. (Source: Pope, Burnett, Thun, Calle, Krewski, Ito, and Thurston, 2002.)

17. Most studies evaluate whether rising air pollution levels worsen health, but it has also been shown that reducing pollution in the air can result in health benefits to the public. These health benefits can occur immediately. For example, Pope (1989) conducted a compelling study clearly showing that, when pollution levels diminish, the health of the general public improves. He investigated a period during the winter of 1986-87 when the Geneva Steel mill in the Utah Valley shut down during a strike. The PM levels dropped dramatically in that strike-year winter, as compared to the winters before and after the steel mill was idle. As shown in Figure 3 below, hospital

admissions in the Utah Valley showed the same pattern as the PM air pollution, decreasing dramatically during the strike. As a control, Pope also examined the pollution and hospital admissions records in nearby Cache Valley, where the mill's pollution was not a factor, and no such drop in respiratory admissions was seen. This shows that the drop in admissions in the Utah Valley was not due to some cause other than the reduction in the air pollution levels.

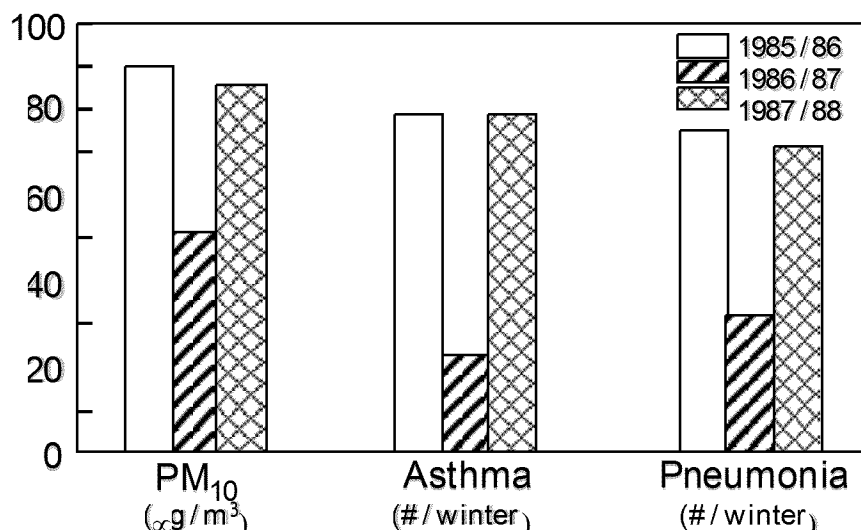


Figure 3. Decreasing PM pollution lowered the number of children's hospital admissions (Source: Pope, 1989).

18. Furthermore, a recent follow-up analyses of the Harvard 6-Cities Study discussed earlier (Dockery *et al.*, 1993), published in the March 15, 2006 issue of The American Journal of Respiratory and Critical Care Medicine (Laden *et al.* (2006)), shows that mortality is decreased by lowering PM pollution. This study was carried

out in six metropolitan areas: Steubenville, Ohio; Watertown, Mass.; Kingston and Harriman, Tenn.; St. Louis, MO; Portage, Wis.; and Topeka, Kan. Study participants' ages ranged from 25 to 74 at enrollment in 1974, and the scientists tracked both PM air pollution and mortality through 1998 in these populations.

19. Laden *et al.* (2006) found that improved overall mortality (*i.e.*, an RR significantly <1.0) was associated with decreased mean $PM_{2.5}$ over the study follow-up time (RR = 0.73; 95% per 10 $\mu g/m^3$, CI = 0.57-0.95). In other words, for each decrease of 1 $\mu g/m^3$ of $PM_{2.5}$, the overall death rate from causes such as cardiovascular disease, respiratory illness and lung cancer decreased by some 3%, while also extending the lives of study subjects. In Steubenville, for example, $PM_{2.5}$ declined from 27 to 22 $\mu g/m^3$ over the course of the study, and the city experienced a corresponding 25% decrease in mortality risk. As reported in the March 21st issue of the New York Times (2006), "For the most part, pollution levels are lower in this country than they were in the 70's and 80's," said Francine Laden, the study's lead author, "and the message here is that if you continue to decrease them, you will save more lives." "Consistently," Dr. Laden said, "in the cities where there was the most cleanup, there was also the greatest decrease in risk of death."

20. There is no convincing evidence to date showing that there is any threshold below which PM exposure is safe for human beings. This lack of a threshold of effects indicates that any reduction in PM pollution can be expected to result in commensurate health benefits to the public at ambient levels. For example, a recent Canadian national-level cohort study, Crouse et al. (2012), has shown that the adverse effects of air pollution extend down to very low levels of PM_{2.5}, well below the prevailing US annual average ambient air quality standard (12 µg/m³). These investigators calculated hazard ratios (i.e., risk ratios) and 95% confidence intervals (CIs), adjusted for available individual-level and contextual covariates, finding a relative risk (or hazard ratio) of 1.30 (95% CI: 1.18, 1.43) for cardiovascular mortality from Cox proportional hazards survival models with spatial random-effects. Figure 4, taken from the Crouse study, illustrates the finding that mortality risk decreases with decreasing levels of PM_{2.5}, even at ambient PM_{2.5} levels down to 1 µg/m³. **These results confirm that, even in places where background air is relatively clean, small changes in air pollution concentration can have population health impacts.**

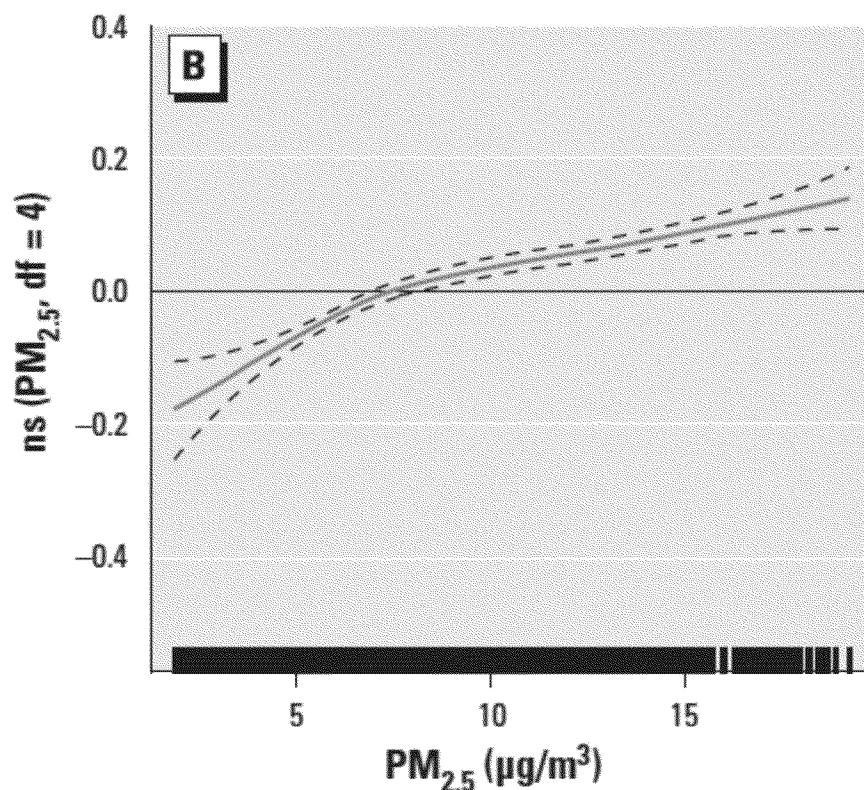


Figure 4. Cardiovascular Mortality Risk vs. $PM_{2.5}$ exposure (solid line) and 95% CIs (dashed lines), showing increasing risk of death with increasing $PM_{2.5}$, even at very low ambient levels of $PM_{2.5}$ air pollution (from Crouse et al., 2012).

21. Even the U.S.EPA has acknowledged that significant air pollution health effects can occur in sensitive populations at air quality levels below the U.S. NAAQS. In its 2013 rulemaking adopting the revised annual particulate matter NAAQS standard, EPA explained that “evidence- and risk-based approaches using information from epidemiological studies to inform decisions on $PM_{2.5}$ standards are complicated by the recognition that *no population threshold, below which it can be concluded with*

confidence that PM_{2.5}-related effects do not occur, can be discerned from the available evidence.” National Ambient Air Quality Standards for Particulate Matter, 78 Fed. Reg. 3,086, 3,098 (Jan. 15, 2013) (emphasis added).

Furthermore, in its calculations of the benefits of reducing the PM_{2.5} NAAQS, the U.S. EPA has acknowledged that there can be extant adverse health risks occurring below the NAAQS. For example, in a recent EPA Regulatory Impact Analysis for reducing the annual PM_{2.5} standard from 15 µg/m³ to 12 µg/m³ (U.S. EPA, 2012), EPA included a figure summarizing the best, most current science regarding PM_{2.5} health effects, which clearly illustrates that air pollution deaths occur below the existing PM_{2.5} NAAQS (35 µg/m³ for the daily standard, and 12 µg/m³ for the annual standard). This figure, shown below, provides EPA’s best estimate of the deaths that would be avoided by implementing the proposed more stringent standard, with roughly half of the avoided deaths occurring in places where the air would be cleaned to levels below (i.e., with air quality better than) the proposed air quality standard. While this particular EPA analysis is for the annual average concentrations, the same principle of effects occurring below the standard applies to the short-term PM_{2.5} standard as well. Thus, just as cleaning the air below the standards would avoid more of those deaths, any increase in pollution will increase the risk of adverse effects at all levels of prevailing air pollution, even well below the present NAAQS standards.

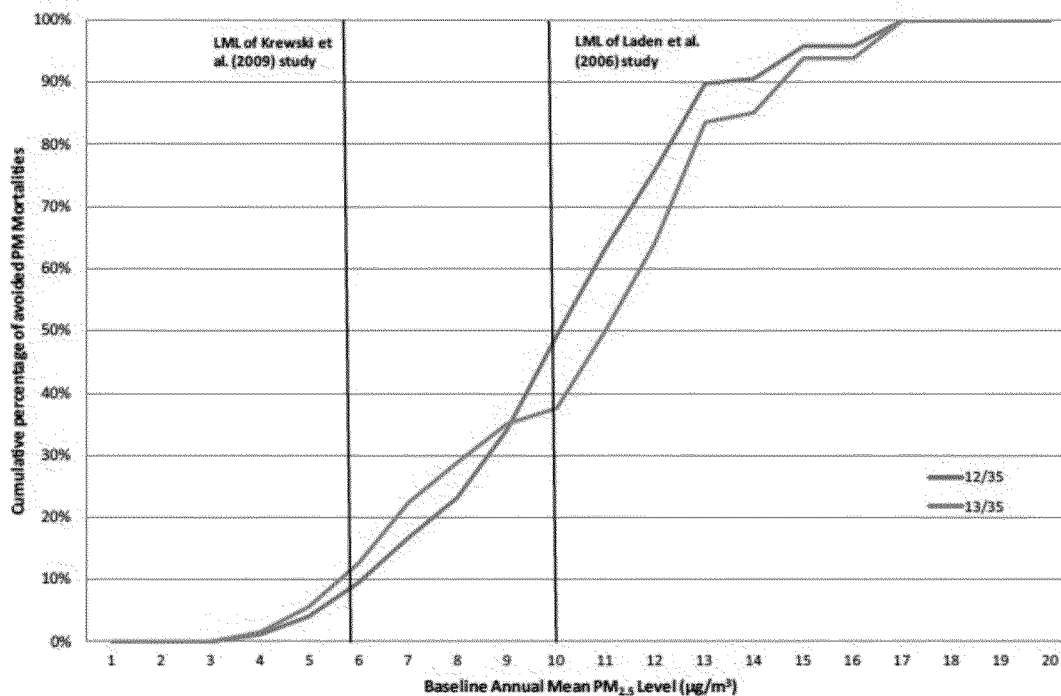


Figure 5. U.S. EPA Regulatory Impact Assessment of the Number of Premature PM_{2.5}-Related Deaths Avoided for 12/35 vs. 13/35 Ambient PM_{2.5} Air Quality Standards. (LML = Lowest Measured Level of PM_{2.5} in the study population) (U.S. EPA 2012, Fig. 5-7)

22. Recent animal experiments at Harvard University by Godleski *et al.* (1996, 2000) indicate that exposures to elevated concentrations of ambient PM can result in cardiac-related problems in dogs that had been pre-treated (in order to simulate sensitive individuals) to induce coronary occlusion (i.e., narrowed arteries in the heart) before exposing them to air pollution. The most biologically and clinically significant finding was that, in these dogs, the PM affected one of the major electrocardiogram

(“ECG”) markers of heart attacks (myocardial ischemia) that is common to humans, known as elevation of the ST segment.

23. Cardiac effects at the biological level have been found in human studies, as well. For example, Pope *et al.* (1999) and Gold *et al.* (2000) found that PM exposure is associated with changes in human heart rate variability (“HRV”). Such changes in HRV may reflect changes in cardiac autonomic function and risk of sudden cardiac death. In the Pope *et al.* study, repeated ambulatory ECG monitoring was conducted on 7 subjects for a total of 29 person-days before, during, and after episodes of elevated PM pollution. After controlling for differences across patients, elevated particulate levels were found to be associated with: (a) increased mean heart rate; (b) decreased SDNN, a measure of overall HRV; (c) decreased SDANN, a measure that corresponds to ultra-low frequency variability; and (d) increased r-MSSD, a measure that corresponds to high-frequency variability. This confirms, at the individual level, that biological changes do occur in heart function as a result of PM exposure, thus supporting the biological plausibility of the epidemiological associations between PM exposure and cardiac illnesses.

24. There is ever-growing scientific evidence indicating that particulate matter (PM) air pollution emitted by fossil fuel burning electrical utility power plants is among the important contributors to the toxicity of PM. Evidence from historical

pollution episodes, notably the London Fog episodes of the 1950's, indicate that extremely elevated daily particulate matter concentrations from fossil fuel combustion may be associated with excess acute human mortality (Ministry of Health of Great Britain, 1954).

Recent epidemiological and toxicological evidence also suggests that the particles resulting from fossil-fuel utility power plant air emissions are among the most toxic in our air. Indeed, my own published analysis of U.S. mortality and PM by source category found that combustion-related particles were more strongly associated with variations in annual mortality rates across U.S. cities than were other components of PM (Ozkaynak and Thurston, 1987). More recently, an analysis by Laden and co-authors (2000) at Harvard University of PM sources and daily pollution confirms that power plant combustion particles, along with automobile pollution, were among the PM components that most affected daily variations in mortality. In addition, toxicological studies have indicated that particles resulting from fossil-fuel combustion that contain metals are very toxic to cells in the lung. Thus, both the toxicological and epidemiological evidence available indicate that pollution from fossil-fuel power plants are of great human health concern.

25. The conclusion that coal-burning power plant particle pollution is one of the more toxic types of particles that we breathe is supported by the facts that

combustion particles have different sizes, physio-chemical characteristics, and deposit in different parts of the lung than other more “natural” particles, such as wind-blown soil. Therefore, these particles can defeat the body’s natural defenses, and thereby have a far greater adverse effect on health. In particular, these power plant particles are enriched in toxic metals, such as arsenic and cadmium, as well as in transition metals, such as iron and vanadium, that can cause damaging oxidative stress in lung cells (See, e.g., Costa et al, 1997; Dreher et al, 1997, and Lay et al, 1999). This may also be especially true in the case of power plant particles because power plant PM is composed of very small particles that bypass the natural defenses of the lung, and therefore can penetrate deep into the lung where they are not easily cleared, and can therefore reside there for long times, potentially causing significant damage to the lung and to the human body. Thus, while PM₁₀ and PM_{2.5} in general pose a health risk to people who breathe them, PM air pollution from power plants is cause for special concern, and the health of persons in impacted populations can be adversely affected by this power-plant related air pollution.

Lab studies also suggest that the presence of acidity in particles, such as those emitted by power generating units, increases the toxicity of PM (e.g., Chen, et al, 1990). This conclusion is supported by studies of human respiratory cells (e.g., Veronesi et al., 1999). The presence of acidity increases the solubility of toxic metals,

thereby making them more biologically-available to damage the body. This may be an important pathway by which acidic particles, such as those resulting from fossil fuel burning power plants, can have heightened toxicity versus other ambient particles, and provides a plausible physiological mechanism for the epidemiological associations found between acidic particle exposures and adverse human health effects.

26. As stated in the most recent U.S. EPA Risk and Exposure Assessment Report for Nitrogen Dioxide (NO₂) (EPA-452/R-08-008a), research studies have provided scientific evidence that is sufficient to infer a similar relationship between short-term (*e.g.*, daily) NO₂ exposure and adverse effects on the respiratory system. This finding is supported by the large body of recent epidemiologic evidence as well as findings from human and animal experimental studies. These epidemiologic and experimental studies encompass a number of endpoints including emergency department (“ED”) visits and hospitalizations, respiratory symptoms, airway hyper-responsiveness, airway inflammation, and lung function (U.S. EPA, 2008).

27. Overall, there is a consistency between the epidemiologic study associations and experimental study results, supporting the conclusions that: (a) there is indeed a cause-effect relationship between PM and NO₂ air pollution and negative health effects; and, (b) there is no known threshold below which no effects are

experienced. Thus, reductions in air pollution cause associated commensurate improvements in public health.

HEALTH IMPROVEMENTS FROM APPLICATION OF BART POLLUTION CONTROL TECHNOLOGY AT THE ELECTRICITY GENERATING UNITS AT ISSUE IN THIS CASE

28. BenMAP is a Windows-based computer program that uses Geographic Information System (GIS)-based methods to estimate the health impacts and economic benefits occurring when populations experience changes in air quality (Abt Associates, 2010). Analysts have relied upon BenMAP to estimate the health impacts from air quality changes at the city and regional scale, both within and beyond the U.S. Some of the purposes for which BenMAP has been used include the following:

- ∞ Comparison of benefits across multiple regulatory programs;
- ∞ Estimation of health impacts associated with exposure to existing air pollution concentrations;
- ∞ Estimation of health benefits of alternative ambient air quality standards.

29. BenMAP is primarily intended as a tool for estimating the health impacts, and their associated economic values, associated with changes in ambient air pollution. It accomplishes this by running health impact functions, which correlate a change in the concentration of a pollutant to a change in the incidence of a health endpoint in a human population.

30. Health impact functions in my BenMAP health effects evaluation work were applied, using BenMAP CE (Community Edition), for counties within 200 km of any of the power plant units at issue in the stay motions (Laramie River Units 1-3, Dave Johnston Unit 3, or Wyodak) modeled by Mr. D. Howard Gebhart. The concentration response functions pooling techniques and valuation approaches used were the same as those applied in recent EPA regulatory impact assessments (e.g., USEPA, 2012). In keeping with the above discussions that there is no known threshold concentration below which air pollution can have no effects, the BenMAP analyses presented here do not presume such a threshold, and assume that any reduction in air pollution leads to a proportionate decrease in health risk, irrespective of the prevailing ambient air pollution concentration level.

31. These BenMAP-CE model analyses considered:

a. the change in ambient air pollution levels—the air quality changes were calculated as the difference between the starting air pollution level, also called the baseline, and the air pollution level after the application of BART (as provided by Mr. D. Howard Gebhart) within 200km of the Wyoming power plants affected by the stay motions;

b. pollutant health effect estimates (based upon the scientific literature and present EPA practice, as discussed in Fann *et al.*, 2012). Each effect estimate is an

estimate of the percentage change in a health effect associated with a one unit change in ambient air pollution;

c. the exposed population (i.e., the people affected by the air pollution reduction), on a county basis, as estimated from Census data for the year 2012; and,

d. the baseline incidence rate of the health endpoint (i.e., the presently prevailing prevalence of people that experience a health endpoint in a given population over a given period of time (*e.g.*, per year), on a county basis. This analysis of health impacts considered some 51 counties surrounding the generating units at issue in this case, with some 2.2 million residents living in the studied areas.

32. For example, in the case of a premature mortality health impact function, the BenMAP calculation would, in a simplified representation of the formula, be:

$$\text{Mortality Change} = (\text{Air Pollution Change}) \times (\text{Air Pollution Mortality Effect Estimate}) \times (\text{Prevailing Mortality Incidence}) \times (\text{Exposed Population})$$

33. BenMAP can also be used to calculate the economic value of health impacts avoided. The program's benefit analysis develops monetary values to inform the policymaking process and allows decision makers to directly compare costs and benefits using the same measure (i.e., dollars). BenMAP is a tool that can support these types of benefit analyses. After calculating the health changes, BenMAP

estimates the economic value by multiplying the reduction of the health effect by an estimate of the economic value per case:

$$\text{Economic Value} = (\text{Health Effect}) \times (\text{Economic Valuation of Health Effect})$$

34. There are several different ways of calculating the value of the health effect. For example, the value of an avoided premature mortality is generally calculated using the Value of Statistical Life (“VSL”). The VSL is the monetary value that people are willing to pay to slightly reduce the risk of premature death. For the purposes of this analysis, I relied on BenMAP’s preloaded EPA monetary valuation selections.

35. The BenMAP CE model indicates that not implementing BART on the generating units at issue in this case will increase the risk of adverse human health effects from PM_{2.5} impacts in the modeled counties, including increased risk of cases of: Acute Bronchitis (1/year; Dockery et al, 1996), Restricted Activity Days (30/year; Ostro and Rothschild, 1989), and 1 or 2 deaths per year, depending on the study chosen to model the mortality effects. Using the ACS Air Pollution Study (Krewski et al., 2011) yields an estimate of 1 death per year, while the 6-Cities Air Pollution Study (Lepeule et al, 2012) gives an estimate of 2 deaths per year. For these effects, the BenMAP CE model therefore yields a valuation of between \$7 and \$17 million dollars, depending on the mortality study employed. Thus, the dollar valuation of the

added human health impacts associated with not applying BART technology to all the generating units at issue here will amount to at least \$7 million per year that control technology is delayed.

36. The BenMAP CE model does not now provide analogous quantitative estimates of annual health impacts and valuations avoided by the implementation of BART on the generating units at issue due to NO_2 concentration reductions, but it is known from the published scientific literature, and past EPA regulatory analyses of NO_2 effects, that increased exposure to NO_2 effects include increased risks of: Missed School Days; Asthma Exacerbations (Asthma Attacks); Asthma Emergency Room Visits; Asthma; Respiratory Hospital Admissions; All Respiratory, and Chronic Lung Disease (less Asthma) (U.S.EPA, 2008). Increased risks of these human health effects of the excess NO_2 concentrations would also be incurred, in addition to the above-noted $\text{PM}_{2.5}$ health effects and dollar impacts, if BART is not applied to the generating units at issue in this case.

37. Based on the above BenMAP results, I conclude that ambient $\text{PM}_{2.5}$ air pollution impacts from the generating units at issue are associated with increased risk of multiple adverse human health effects, including mortality, restricted activity days, acute bronchitis, and other respiratory ailments. Among people most affected by such pollution are those with pre-existing respiratory and cardiac disease, infants and

children, and the elderly. Indeed, the health effects and valuation analyses I have developed and presented above demonstrate that human health impacts from air pollution can be avoided by the implementation of BART at the generating units at issue, as per EPA's FIP, with significant total monetary valuations in each year that the control technology is applied.

38. Overall, the counts and dollar valuation benefits of cleaner air that I have presented are conservative estimates of the health benefits after the application of BART to the generating plants at issue, as per EPA's FIP, for a number of reasons. These reasons include: (a) consideration here of health impacts only in counties within 200km of the subject units, even though the emissions from these units likely affect ambient air concentrations in communities beyond this geographic region; (b) additional health impacts not modeled in this analysis attributable to reductions in other pollutants (*e.g.*, Ozone) are not included here; (c) consideration of health impacts only for the ages of the exposed populations that were considered in the epidemiological studies on which these analyses were based (*e.g.*, acute bronchitis was only considered for individuals aged 8-12); and, (d) there is either no health impact study or no dollar valuation for many health outcomes thought to be adversely affected by air pollution, such as effects of air pollution on birth outcomes and on infants. Thus, while all air pollution control costs associated with application of

BART can be estimated, estimates of the health benefits and their monetary valuations are only available for a subset of likely health impacts from air pollution. This means that my analysis is conservative, and likely underestimates the health and monetary benefits of applying EPA's BART determination to the Wyoming generation units at issue in this case.

39. That said, using an EPA modeling-based analysis, I conservatively estimate the total public health-based economic benefits associated with reductions in ambient PM_{2.5} concentrations as a result of applying EPA's BART determination to the generating units at issue in this case to be between \$7 to \$17 million per year, overall, depending on the epidemiological study used in EPA's BenMAP model to determine the mortality impacts (i.e., Krewski *et al.* or Lepeule *et al.*, respectively).

CONCLUSIONS

40. Based upon these analyses, the health benefits and their valuations derived from the application of EPA's BART determination to the generation units at issue are substantial. Moreover, these benefits and their valuations accrue each and every year after BART, as per EPA's FIP, is operational. Accordingly, ten years from the point that BART is operational, the health benefits and valuations of BART will be roughly ten times the values provided above, before adjustment for a discount rate, as appropriate. Similarly, these benefits and their valuations are not accrued each and

every year that operation of the BART is delayed. Thus, even a delay of just a matter of months carries the risk of substantial, and irreparable, harm to public health, which has substantial associated adverse economic valuations. Thus, it is reasonable to conclude that any further delay to implementation of EPA's BART determination for the generation units at issue will only exacerbate the substantial, and irreparable, harms to public health that have already occurred from the failure to control air pollution from these units to date.

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I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct to the best of my knowledge. 28 U.S.C. § 1746.

Executed in Chester, New York on June 26, 2014.

A handwritten signature in cursive script, appearing to read "G. D. Thornton, S.D.", with a large, stylized initial "G" and a flourish at the end.

EXHIBIT A

February 2014

Curriculum Vitae

GEORGE D. THURSTON

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Email: george.thurston@nyu.edu<http://www.med.nyu.edu/biosketch/gdt1/research>**Education**

Degree	Field	Institution
Diploma	Academic	Barrington High School, RI
Sc.B. (Honors)	Environmental Engineering	Brown University
A.B.	Environmental Studies	Brown University
S.M.	Environmental Health Sciences	Harvard Univ. Schl. of Public Health
Sc.D.	Environmental Health Sciences	Harvard Univ. Schl. of Public Health

Postdoctoral Training

Specialty	Mentor	Place of Training
Environ. Epidemiology	Dr. H. Ozkaynak	Harvard Univ., Kennedy Schl. of Gov., Camb., MA

Internships and Residencies N/A**Clinical and Research Fellowships** N/A**Licensure and Certification** N/A**Academic Appointments**

1987-1993	Assistant Professor, Dept. of Environmental Medicine, New York University School of Medicine, New York City, NY.
1993-2006	Associate Professor (Tenured), Dept. of Environmental Medicine, New York University School of Medicine, New York City, NY.
2007-present	Professor (Tenured), Dept. of Environmental Medicine, New York University School of Medicine, New York City, NY.
2007-present	Affiliated Faculty, Environmental Studies Program, College of Arts and Sciences, New York University, New York City, NY.
2012-present	Affiliated Faculty, Marron Institute on Cities and the Urban Environment, New York University, New York City, NY
2012-present	Faculty Mentoring Champion, Dept. of Environmental Medicine, New York University School of Medicine, New York City, NY.

Hospital Appointments: N/A**Other Professional Positions and Visiting Appointments:**

Oak Ridge Institute for Science and Education (ORISE) Fellow (2008-2010)

Major Administrative Responsibilities

<i>Year</i>	<i>Title, Place of Responsibility</i>
1995-2004	Director, Community Outreach and Environmental Education Program, NYU-NIEHS Center of Excellence, Nelson Inst. of Environ. Med., NYU School of Medicine, Tuxedo, NY
2002-2012	Deputy Director, NYU Particulate Matter Research Center, Nelson Inst. of Environmental Medicine, NYU School of Medicine, Tuxedo, NY
2007-2008	Director, Environmental Epidemiology Core, NYU -NIEHS Center of Excellence, Department of Environmental Medicine, Tuxedo, NY
2010-present	Co-Leader, Metals Research Focus Group, NYU -NIEHS Center of Excellence, Department of Environmental Medicine, Tuxedo, NY.
2012-present	Director, Program in Exposure Assessment and Human Health Effects, Department of Environmental Medicine, NYU School of Medicine.
2012-present	Chair, Appointments and Promotions Committee, Department of Environmental Medicine, NYU School of Medicine.
2014-present	Co-Chair, Environmental Health Research Affinity Group, NYU Global Institute of Public Health (GIPH), New York University, Washington Square.

Teaching Experience

<i>Year</i>	<i>Name of course</i>	<i>Type of Teaching/Contact Hrs.</i>
1984-1994	Air Poll. Transport Modeling (G48.2048)	Course Director
2006-present	Weather, Air Pollution, and Health (G48.1010)	Course Director
1986-present	Aerosol Science (G48.2033)	Course Director
1984-2010	Environmental Contamination (G48.2305)	Lecturer
1984-present	Environ. Hygiene Measurements (G48.2035)	Lecturer/Lab
1990-1998	Environmental Toxicology (G48.1006)	Lecturer
1993-1995	Environmental Epidemiology I (G48.2039)	Lecturer
2001-2003	NYU Summer Institute, Wagner School	Lecturer
2006-present	Environmental Epidemiology I (G48.2039)	Lecturer
2006-present	Science, Health & Envir. Journalism (G54.1017.0)	Lecturer
2009-2011	Global Environmental Health (U10.2153.1)	Course Director
2009-2012	Global Issues in Environ. Health (G48.1011)	Course Director
2009-present	Earth Systems Science (undergrad) (V36.0200)	Lecturer
2011-present	Principles of Environmental Health (G48.1004)	Course Director
2013-present	Environ. Hygiene Measurements (G48.2035)	Course Co-Director

Awards and Honors

November 1999	Orange Environment Citizens Action Group, OE Award for Excellence in Translating Science to the Public
December 2000	NYU School of Medicine Dean's Research Incentive Award
October 2012	Recipient of the "Haagen Smit Prize" for Best Paper, <u>Atmospheric Environment</u> . http://geo.arc.nasa.gov/sgg/singh/winners12.html
March 2013	Recipient of the "Best Paper of the Year – Science" Award from <u>ES&T</u> http://pubs.acs.org/doi/full/10.1021/es400924t

Major Committee AssignmentsNew York University Committees

2007-present: University Sustainability Task Force
 2010-2012: University Faculty Senate Alternate
 2012-2013: University Faculty Senator

NYU School of Medicine Departmental Committees

1992-1998: Sterling Forest Library Committee, Member, NYU SOM Dept of Environ. Medicine
 1991-1994 Health & Safety Committee, Member, NYU SOM Dept. of Environ.. Medicine
 1992-2004 Community Outreach and Education Comm., Chairman, NYSOM Dept. of Environ. Med.
 1999-2004 Dept. Chairman's Internal Advisory Comm., Member, NYUSOM Dept. of Environ. Med.
 2005-present Dept. Academic Steering Committee, Member, NYUSOM Dept. of Environ. Medicine
 2007-2012 Dept. Appointments & Promotions Comm., Member, NYUSOM, Dept. of Environ. Medicine
 2012-present Dept. Appointments & Promotions Comm., Chair, NYUSOM, Dept. of Environ. Medicine

Advisory Committees

Regional

1983-1984 Massachusetts Acid Rain Advisory Board, Member, Mass. Dept. of Env. Protection
 1984-1986 Committee on Environ. And Occup. Health. , NY State American Lung Association
 1991-1996 Air Management Advisory Comm., Member of Health Effects Subcom., NY State DEC
 1995-1999 Engineering Advisory Board, Member, Tuxedo, NY
 1997-1998 Advisory Committee to the Mayor on the Port of Newburgh, Member, Newburgh, NY
 1996-1999 CUES Asthma Working Group, Member, New York Academy of Medicine
 2008-2010 New York City Community Air Study (NYCCAS) Advisory Panel

National

1995-1999 Comm. on Health Effects of Waste Incineration, Member, National Academy of Sciences
 1995-1999 National Air Conservation Commission, Member, American Lung Association
 2000-2004 National Action Panel on Environment, Member, American Lung Association
 2005-present National Clean Air Committee, Member, American Lung Association
 2007-2010 U.S. EPA Clean Air Science Advisory Committee (CASAC) for SO_x and NO_x
 Mar. 2012 EPA Panelist for "Kickoff Workshop to Inform EPA's Review of the Primary NO₂ NAAQS"

International

1996-1997 Sulfur in Gasoline Health and Environment Panel, Chairperson, Health Canada
 Sept. 2007 Illness Cost of Air Pollution Expert Committee, Canadian Medical Association
 2008-2012 Global Burden of Disease (GBD), Committee on the Human Health Effects of Outdoor Air Pollution, World Health Organization (WHO)

Grant Review Committees (National)

March 1989 EPA Air Chemistry and Physics Extramural Grants Review Panel (*ad hoc member*)
 Oct. 1989 NIEHS P30 Center Special Review Panel (*ad hoc member*)
 July 1992 NIH R01 Epidemiology & Disease Control Study Section (*ad hoc member*)
 Nov. 1992 NIEHS P20 Center Development Grant Special Study Section, (*ad hoc member*)
 June 1996 EPA Special Review Panel of the Health Effects Institute (HEI) (*ad hoc member*)
 March 1997 EPA Office of Res. and Development External Grant Review Panel (*ad hoc member*)
 April 1997 NIEHS Community-Based Participatory Res. R01 Special Study Sect. (*ad hoc member*)
 July 1997 EPA National Environ. Research Lab Intramural Research Review Panel (*ad hoc member*)
 June 1998 EPA Office of Res. and Development External Grant Review Panel (*ad hoc member*)
 July 1998 EPA Climate Policy and Programs Division Grant Application Review (*ad hoc member*)
 Oct. 1998 Mickey Leland Center for Air Toxics Grant Review Panel (*ad hoc member*)
 April 2000 NIEHS P30 Center Special Review Panel (*ad hoc member*)
 July 2001 NIEHS Community-Based Participatory Res. R01 Special Study Sect. (*ad hoc member*)
 Dec. 2001 NIEHS Program Project P01 Site Visit Review Panel (*ad hoc member*)
 April 2003 NIH R21 Fogarty Health, Env. and Economic Development Study Sect. (*ad hoc member*)
 Nov. 2003 U.S. EPA STAR Grant Panel (Epidemiologic Research on Health Effects of Long-Term Exposure to Ambient Particulate Matter and Other Air Pollutants) (*member*)
 October 2004 NIEHS Program Project P01 Review Panel (*ad hoc member*)
 June 2005 NIH Special Emphasis Panel (ZRG1 HOP Q 90 S) (*ad hoc member*)

Nov. 2005	NIH Infectious Disease, Reproductive Health, Asthma/Allergy, and Pulmonary (IRAP) Conditions Study Section Review Panel (<i>ad hoc member</i>)
Feb. 2006	NIH Infectious Disease, Reproductive Health, Asthma/Allergy, and Pulmonary (IRAP) Conditions Study Section Review Panel (<i>ad hoc member</i>)
June 2006	NIH Infectious Disease, Reproductive Health, Asthma/Allergy, and Pulmonary (IRAP) Conditions Study Section Review Panel (<i>ad hoc member</i>)
Dec. 2006	NIEHS Special Emphasis Panel on Genetics, Air Pollution, and Respiratory Effects (ZES1 TN-E FG P) (<i>member</i>)
Nov. 2007	NIH Special Emphasis Panel on Community Participation in Research (ZRG1 HOP-S) (<i>member</i>)
June 2009	NIH Study Section Review Panel on Challenge Grants in Health & Science Research
March 2011	U.S. EPA Science to Achieve Results (STAR) Graduate Fellowship Review Panel – Clean Air Panel (<i>chair</i>)
Sept. 2011	NIH Special Epidemiology Study Section (ZRG1 PSE K 02 M) (<i>member</i>)
Oct. 2012	NIH Cardiac and Sleep Epidemiology (CASE) Study Section (<i>ad hoc member</i>)
June 2013	NIH Special NHLBI Dataset Study Section (ZRG1 PSEQ 56) (<i>member</i>)
July 2013	NIH “Career Awards” Study Section (ZES1 LWJ-D, K9) (<i>member</i>)
Sept. 2013	Appointed Permanent Member, NIH Cardiac & Sleep Epid. (CASE) Study Section

Memberships, Offices, And Committee Assignments In Professional Societies

<i>Year</i>	<i>Society/Committees</i>
1980-1996	Air and Waste Management Association (Comm. on Health Effects and Exposure,)
1992-Present	American Thoracic Society (ATS): Environmental and Occup. Health (EOH) Assembly, 1995-1999, 2012-present: ATS EOH Long Range Planning Committee; 1993-1994, 2002-2004: ATS Program Committee 2006-2007 Chairman of the ATS-EOH Nominating Committee 2010-present: ATS Environmental Health Policy Committee, member 2012-present: ATS Environmental Health Policy Committee, Vice-Chairman
1990-present	International Society of Exposure Science
1992-present	International Society for Environmental Epidemiology (Annual Meeting Program Committee: 1998, 2000, 2003, 2004, 2006) (ISEE Conference Planning Committee: 2006-present)
2007-2009	New York Academy of Sciences (membership given in appreciation for a 1/23/07 NYAS forum presentation)

Editorial Positions

<u>Journal Board Membership</u>	
<i>Year</i>	<i>Name of Board</i>
1993-2008	International Society of Exposure Analysis (J. of Exp. Anal. and Environ. Epid.)
<u>Ad Hoc Manuscript Reviewer</u>	
<i>Years</i>	<i>Journal</i>
1996-1998	American Journal of Epidemiology
1994	Archives of Environmental Health
1995-present	Atmospheric Environment
1995-present	Environmental Health Perspectives
1994-present	Environmental Research
2004-present	Environmental Science and Technology
2011-present	Epidemiology

1993-present	Journal of Exposure Analysis and Environmental Epidemiology
1994-present	Journal of the Air and Waste Management Association
1996-present	Journal of the American Medical Association
1997-present	Journal of Occupational and Environmental Medicine
1997-present	Journal of Respiratory and Critical Care Medicine
2006-present	Thorax

Scientific Report Reviewer

August, 1986	Reviewer for the National Academy of Sciences, Board on Environmental Studies and Toxicology report "The Airliner Cabin Environment: Air Quality and Safety"
October, 2002	Reviewer for the NAS, Board on Environmental Studies and Toxicology report "Estimating the Public Health Benefits of Proposed Air Pollution Regulations"

Mentoring of Graduate Students, Residents, Post-Doctoral Fellows in Research

Under direct supervision:

<i>Student Name</i>	<i>Type of Position</i>	<i>Time Period</i>	<i>Present Position</i>
Mark Ostapczuk	Masters	1984-1986	Industrial Hyg., Barr Labs, Pomona, NJ
Kazuhiko Ito	Masters/Doctoral	1984-1990	Scientist, NYC Dept. of Health, NYC, NY
Peter Jaques	Masters/Doctoral	1988-1998	Assoc. Prof., Clarkson Univ., Potsdam, NY
R. Charon Gwynn	Masters/Doctoral	1992-1999	Epidemiologist, Columbia Univ., NY
Ramona Lall	Masters/Doctoral	2000-2007	Research Sci. IV, NYC Dept. of Health, NY
Ariel Spira-Cohen	Masters/Doctoral	2003-2009	Research Sci. III, NYC Dept. of Health, NY
Kevin Cromar	Masters/Doctoral	2008-2012	Assistant Professor, NYU School Of Medicine
Lital Yinon	Doctoral	2011-present	Doctoral Candidate, NYU School of Medicine

In advisory function (thesis committee):

<i>Student Name</i>	<i>Advisory Role</i>	<i>Time Period</i>	<i>Student's Supervisor</i>
Shao-Keng Liang	Doctoral Committee member	1990-1994	Dr. J. Waldman, UMDNJ, Rutgers
Jerry Formisano	Doctoral Committee member	1997-2000	Dr. M. Lippmann, NYU SOM
Yair Hazi	Doctoral Committee member	1993-2001	Dr. B. Cohen, NYU SOM
Samantha Deleon	Doctoral Committee member	1997-2003	Dr. K Ito, NYU SOM
Chun Yi Wu	Doctoral Committee member	2000-2004	Dr. L.C. Chen, NYU SOM
Carlos Restrepo	Doctoral Committee member	2002-2004	Dr. R. Zimmerman, Wagner, NYU
Shaou-I Hsu	Doctoral Committee member	2000-2009	Dr. M. Lippmann, NYU-SOM
Steven Schauer	Doctoral Committee member	2007-2009	Dr. B. Cohen, NYU-SOM
Christine Ekenga	Doctoral Committee Chair	2009-2011	Dr. G. Friedman-Jimenez, NYU-SOM
Rebecca Gluskin	Doctoral Committee Chair	2009-2012	Dr. Kazuhiko Ito, NYU SOM
Jiang Zhou	Doctoral Committee Chair	2008-2012	Dr. Kazuhiko Ito, NYU SOM

Teaching Awards Received

N/A

Major Research Interests

- 1) Air Pollution Epidemiology: Real-world air pollution exposures and human health effects in the general population and study cohorts of suspected susceptible individuals (e.g., children).
- 2) Aerosol Science: Ambient particulate matter aerosol exposures, including designing and implementing air monitoring equipment to collect human exposures to air pollution.

3) Environmental Exposure Assessment: Methods to assess human exposures and health effects from air pollution, especially the development of source apportionment models to separate human effects on the basis of pollution source. Design of epidemiological models /methods that better incorporate potential air pollution confounders/effect modifiers (e.g. weather and genetic influences).

Grants Received

Prior:

Agency	Title	Grant #	Period	Total Direct Costs	Role	% Effort
USEPA	Effects of Acute Exposure to Summertime Haze Episodes on the Health of Humans	R811563	05/01/84-09/30/87	\$538,586	Co-I	50%
NIH	Acid Aerosol Exposure: Effect on Respiratory Morbidity	R01 ES04612	09/25/87-08/31/92	\$846,966	PI	30%
USEPA	Acid Aerosol Chamber Experiments	OD2524AEX	7/2/90-7/31/90	\$5,810	PI	9%
USEPA	Analysis of Acid Aerosol Experiments	00422248NAEX	8/1/90-9/30/90	\$3,364	PI	5%
USEPA	Air Pollutants and Human Health	R814023	05/18/87-05/17/91	\$690,921	CO-I	50%
USEPA	Development and Field Applic. of an Automated Sequential Weekly Average H+ Sampler	Subcontract to EPA Grant CR816740-03	6/1/92-2/28/93	\$13,156.	PI	15%
NIH	Acid Aerosol Exposure: Effect on Respiratory Morbidity	R01 ES04612	09/01/92-08/31/95	\$377,298.	PI	30%
HEI	Retrospective Characterization of Ozone Exposures	Health Effects Institute Grant	11/1/93-10/31/94	\$98,238	CO-I	10%
NIH	Temperature and Air Pollution Effects on Human Mortality	R01 ES05711	6/1/92-5/31/93	\$371,993	PI	30%
NYUSOM	Environmental Effects on Human Mortality and Morbidity	Bridge Grant	9/1/95-8/31/96	\$48,400	PI	-
USEPA	Effects of Exposure to Ambient Air Pollutants on Human Health	R808325	10/1/91-09/30/96	\$870,565	CO-I	50%
USEPA	Investigation of Acid Aerosol Exposures in Metropolitan Settings	Subcontract to Grant No. CR822050	11/1/93-10/31/96	\$200,499	PI	10%
USEPA	An Evaluation of Potential Confounders in PM10 Mortality Associations	R825271	11/25/96-11/24/01	\$219,410	CO-I	10%
USEPA	Acidic PM and Daily Human Mortality in Three U.S. Cities	#R825264	11/25/96-11/24/00	\$232,671	PI	15%
NYS-ERDA	Environmental Monitoring, Evaluation, and Protection Program	6084-ERTER-ES00	12/01/99-11/30/02	\$341,926	PI	20%
HEI	Children's Asthma Incidence and Personal Exposures to Diesel Particles and Traffic in NYC		01/01/02-12/31/02	\$154,800	PI	30%
USEPA	Influence of Alternate Indicators of Exposure to PM and PM	R827358	03/01/99-02/28/03	\$183,089	PI	30%

	Components in Statistical Associations with Mortality and Hospital Admissions					
NIH	NIEHS Center Supplement: Health Issues Related to the World Trade Center Disaster, Outreach Project	ES00260-S1	04/01/02-03/31/03	Total=\$ 936,487 Outreach=\$172,031	Co-PI PI	10% 15%
NIH	Effects of Ambient Air Pollutants on Annual Mortality	RO1 ES09560	9/15/99-8/31/03	\$471,408	PI	30%
USEPA	Particle Exposures of High-Risk Sub Populations	R827164	10/01/98-09/30/03	\$1,327,240	Co-I	10%
USEPA	A Source Oriented Evaluation of the Combined Effects of Fine Particles and Co-pollutants	R827997	02/01/00-01/31/04	\$291,407	Co-I	15%
NIH	NIEHS Center Grant: Outreach and Education Program	ES00260	04/01/00-03/31/05	Total=\$5,000,000 Outreach=\$240,365	Co-I PI	5% 5%
USEPA	EPA PM Health Effects Center Project 6: "A Prospective Study of Asthma Susceptibility to PM Epidemiologic Investigations of Key PM Components and Biomarkers of Effects & Community Outreach Project	R827351	06/01/99-05/31/05	Total=\$6,000,000 Project 6=\$134,923 Outreach=\$77,779	Co-PI PI PI	15% 10% 10%
NIH	Genetic/Epigenetic Susceptibility to Superfund Chemicals: Outreach Project	ES010344	05/08/00-03/31/06	\$156,812	Co-I	5%
USEPA	Env. Issues in the South Bronx. Thurston Project: S. Bronx Backpack Study	X1982152	08/01/00-09/30/06	Total=\$921,922 Project=\$307,131	CO-I PI	5% 15%
NIH	NIEHS Center Supplement: Health Issues Related to the World Trade Center Disaster, Source Attribution (Project 4) & Community Outreach	ES00260-S2	04/01/02-03/31/04	Total=\$660,000 Project 4=\$69,999 Outreach=\$172,031	Co-PI PI PI	10% 10% 15%
USEPA	The role of traffic -related pollution in PM health effects associations among inner -city children with asthma	16511	09/01/06-08/31/09	\$51,516	PI	-
California Air Resources Board (CARB)	Spatio-temporal Analysis of Air Pollution and Mortality in California Based Upon the ACS Cohort (Thurston: Consulting Project)		06/01/07-5/31/10	Project=\$13,634	Co-I	4%
USEPA	Real time modeling of weather, air pollution, health outcome indicators in NYC.	RD-83362301-0	12/07-11/10	\$130,496	Co-I	5%
NIH	Fine Particles and Out-of-Hospital Cardiac Arrest in New York City	R01ES014387-01A2	04/09-12/11	\$200,000	Co-I	10%

Health Effects Institute (HEI)	Characteristics of PM Associated with Health Effects. <i>Thurston Project</i> : "Study Of PM Components and U.S. Human Mortality In The ACS Cohort.	4750	01/01/07-3/31/11	Total=\$3,247,567 Project=\$355,920	Co-I PI	5% 20%
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Current:

Agency	Title	Grant #	Period	Total Direct Costs	Role	% Effort
New York State DOT	Mobile Source Air Toxics (MSATs) Mitigation Measures		09/01/10 06/31/13	SubProject=\$89,062	Co-I	10%
Robert Wood Johnson Foundation	The Effect of Peak-Shaving Regulations on the Activity, Toxic Emissions, and Health Impacts of Local Power Plants	Public Health Law Research	1/12-7/13	\$151,500	Co-I	10%
NIH	Long-term Air Pollution Exposure and Mortality in the NIH-AARP Cohort.	R01ES019584-01A1	1/01/12-6/30/16	\$1,221,253	MPI (Contact PI)	20%
The Public Health Research Institute of Abu Dhabi	Development of a Public Health Research Institute in Abu Dhabi. <i>Thurston Project</i> : "Air Pollution in Abu Dhabi".		3/2012-2/2017	\$9,993,960	Co-I	10%
NIH	Dietary Influence on Mortality from Air Pollution Exposure in the NIH -AARP Cohort (R21)	1R21ES021194-01	7/12-6/14	\$150,000	MPI (Contact PI)	8%

Patents

None

Boards and Community Organizations

1990-1995 St. Mary's Episcopal Church, Tuxedo, NY, Vestry member
1992-2008 Monroe-Woodbury Soccer Club, Coach (Board Member: 1999-2000)
1994-1999 Orange County Citizen's Foundation, Member
1999-2009 Y2CARE Monroe-Woodbury, NY School District Residents Action Group, Founder
2005-present St. Mary's Episcopal Church, Tuxedo, NY, Community Outreach Committee, Member
2006-present EPISCOBUILD-Newburgh, NY Habitat for Humanity Advisory Board, Member
2012-present St. Mary's Episcopal Church, Tuxedo, NY, Vestry member

Military Service

None

International Scientific Meetings Organized

- May 28-30, 2003 “Workshop on the Source Apportionment of PM Health Effects.” U.S. EPA PM Centers, Harriman, NY.
- Aug. 1-4, 2004 “Sixteenth Conference of the International Society for Environmental Epidemiology,” Kimmel Conference Center, Washington Square, New York University, New York City, NY.

Scientific Forums for the Public Organized

- June 2001 “Science and Community Interaction Forum on the Environment.” Held at Hostos Community College, Bronx, , New York City, NY.
- October 2001 “Forum on Environmental Health Issues Related to the World Trade Center Disaster.” Held at NYU Law School, Washington Square, New York City, NY.
- October 2002 “2nd Annual Forum on the Environmental Health Issues Related to the World Trade Center Disaster.” Held at Manhattan Borough Community College, New York City, NY.
- October 2003 “3rd Annual Forum on the Environmental Health Issues Related to the World Trade Center Disaster.” Held at NYU Lower Manhattan Campus, New York City, NY.

Invited U.S. House and Senate Congressional Testimony

- Feb. 5, 1997 “Human Health Effects of Ambient Ozone Exposures” Statement before the Committee on Environment and Public Works, Subcommittee On Clean Air, Wetlands, Private Property, And Nuclear Safety, U.S. Senate, Washington, DC.
<http://epw.senate.gov/105th/thurston.htm>
- April 16, 1997 “Human Health Effects of Ambient Ozone and Particulate Matter Exposures.” Statement before the Government Reform and Oversight Committee of the U.S. House of Representatives, Washington, D.C.
- May 8, 1997 “Human Health Effects of Ambient Ozone and Particulate Matter Exposures.” Statement before the Subcommittee on Health and Environment, Committee on Commerce of U.S. House of Representatives, Washington, D.C.
- July 29, 1997, “The Human Health Effects of Ambient Ozone And Particulate Matter Air Pollution.” Statement before the Subcommittee on Commercial and Administrative Law of the Judiciary Committee of the U.S. House of Representatives, Washington, D.C.
<http://judiciary.house.gov/legacy/commercial.htm>
- October 22, 1997 “Ozone and Particulate Matter Air Pollution Health Effects.” Statement before the U.S. Senate Committee on Environment and Public Works Subcommittee on Clean Air, Wetlands, Private Property, and Nuclear Safety. Washington, DC.
<http://epw.senate.gov/105th/thursto2.htm>
- July 15, 1999: “The Mandated Release of Government-Funded Research Data.” Statement before the Committee On Government Reform, Subcommittee on Government Management, Information And Technology, U.S. House of Representatives
- July 26, 2001 “The Human Health Effects Of Air Pollution From Utility Power Plants.” Statement before the Committee on Environment and Public Works, U.S. Senate, Washington, D.C.
<http://www.c-spanvideo.org/program/PlantE>
- Feb 11, 2002: “The Air Pollution Effects of The World Trade Center Disaster.” Statement before the Committee On Environment And Public Works, Subcommittee On Clean Air, Wetlands, And Climate Change. United States Senate, New York, NY.
<http://www.c-spanvideo.org/program/Qualitya>

- March 5, 2002 “The Use of the Nationwide Registries to Assess Environmental Health Effects.” Statement before the Committee On Health, Education, Labor, And Pensions, Subcommittee On Public Health, U.S. Senate, Washington, DC.
- Sept. 3, 2002 “The Clean Air Act and The Human Health Effects of Air Pollution from Utility Power Plants.” Statement before the U.S. Senate Committee on Health, Education, Labor, and Pensions, Subcommittee on Public Health, Washington, D.C. <http://www.c-spanvideo.org/program/AirStand>
- April 1, 2004 “The Human Health Benefits Of Meeting the Ambient Ozone And Particulate Matter Air Quality Standards.” Statement before the Committee on Environment and Public Works, Subcommittee on Clean Air, Climate Change, and Nuclear Safety, U.S. Senate, Washington, D.C.
<http://epw.senate.gov/epwmultimedia/epw040104.ram>
- July 19, 2006 “The Science And Risk Assessment Of Particulate Matter (PM) Air Pollution Health Effects.” Statement before the Committee on Environment and Public Works, U.S. Senate, Washington, D.C.
<http://epw.senate.gov/hearingstatements.cfm?id=258766>
- May 7, 2008 “Science And Environmental Regulatory Decisions _____.” Statement before the Committee On Environment And Public Works of The U.S. Senate, Subcommittee on Public Sector Solutions to Global Warming, Oversight, and Children’s Health Protection, U.S. Senate, Washington, D.C.
<http://www.c-spanvideo.org/program/RegulatoryD>
<http://epw.senate.gov/public/index.cfm?FuseAction=Hearings.Hearing&HearingID=a1954f70-802a-23ad-4192-fc2995dda7f4>
- October 4, 2011 “The Science of Air Pollution Health Effects and the Role of CASAC in EPA Standard Setting _____.” Statement before the Subcommittee on Energy and the Environment, Committee on Science , Space and Technology , U.S. House Of Representatives, Washington, DC.
<http://science.house.gov/hearing/energy-and-environment-subcommittee—hearing-quality-science-quality-air>

Other Invited Presentations

Regional Presentations

- April 21, 1993 “Summertime Smog and Hospital Admissions for Respiratory Illness”, Environmental and Occupational Health Sciences Institute Seminar Series Lecture, UMDNJ-Robert Wood Johnson Medical School, Piscataway, NJ.
- Dec .14, 1995 “Health Effects of Acidic Aerosols”, NY State Dept. of Health, Wadsworth Center Seminar, Albany, NY
- Jan. 18, 1996 “Outdoor Air Pollution and Asthma in Children” “ American Lung Association Press Briefing, New York, NY.
- June 1, 1996 “Asthma and Urban Air Pollution”, WHEACT, Harlem Hospital, New York, NY.
- July17, 1996 “Asthma and Outdoor Air Pollution”, Making the Connection: Urban Air Toxics & Public Health. Northeast States for Coordinated Air Use Management (NESCAUM), Roxbury, MA
- Feb. 11, 1997 “Outdoor Air Pollution and Asthma”,_Bellevue Hospital Asthma Clinic *Grand Rounds*. New York City, NY.
- Feb. 26, 1998 “Scientific Research for Ozone and Fine Particulate Standards “, Pace University School of Law, White Plains, NY
- Nov. 30, 1998 “Outdoor Air Pollution and Asthma”, Center for Urban and Environmental Studies (CUES), NY Academy of Medicine,, New York, NY

Feb. 22, 1999 "Asthma and Air Pollution", Cornell University, Ithaca, NY

April 28, 2001 "Asthma and Air Pollution in New York City", NYC Council Environmental Candidate School, NY League of Conservation Voters, New York, NY.

Nov. 1, 2001 "Air Quality and Environmental Impacts Due to the World Trade Center Disaster", Testimony before the Comm. on Environ. Protection, NYC Council, New York, NY.

Nov. 13, 2001 "WTC Pollution Impacts in Lower Manhattan", Stuyvesant High School Parents Association General Meeting, Stuyvesant High School, New York, NY

Feb. 28, 2002 "Lung Cancer Effects of Long-Term Exposure to Ambient Fine Particulate Matter", Mailman School of Public Health, Columbia University, New York, NY.

April 5, 2002 "Air Pollution Impacts of the WTC Disaster", 23rd Annual Scientific Conference of the NY/NJ Education and Research Center: "Worker Health and Safety: Lessons Learned in the Aftermath of Sept. 11, 2001," Mt. Sinai School of Medicine, NYC, NY

April 21, 2002 "Adverse Health Effects of Power Plant Air Pollution on Children" Earth Day 2002, 14th Street Y, New York City, NY.

May 23, 2002 "Human Health Effects of Power Plant Pollution", Rockland County Conservation Association, Suffern, NY

May 31, 2002 "Environmental Health Impacts of the World Trade Center Disaster", University of Rochester Medical School, Rochester, NY.

Sept. 19, 2002 "Community Air Pollution Related to the World Trade Center Disaster". NYC Council Forum: The Environmental Health Consequences of 9/11: Where Do We Stand One Year Later? Borough of Manhattan Community College, New York City, NY.

Oct. 3, 2002 "Community Exposures to Particulate Matter Air Pollution from the World Trade Center Disaster", Mount Sinai School of Medicine *Grand Rounds*, New York City, NY.

April 11, 2003 "Environmental Impacts of the World Trade Center Disaster", NIEHS Public Interest Liaison Group, New York City, NY.

April 21, 2003 "Asthma and Air Pollution", Airborne Threats to Human Health, NIEHS Town Hall Meeting, Syracuse, NY.

May 7, 2003 "Asthma and Air Pollution in NY City" Environmental Candidate School for New York City Council Candidates, Wagner School, NYU, New York City, NY.

July 21, 2003 "Health Effects of Particulate Matter Air Pollution", Ozone Transport Commission, Philadelphia, PA.

Nov. 18, 2004 "Ambient Air Pollution Particulate Matter (PM): Sources and Health Impacts". U.S. Environmental Protection Agency, Region 2, New York City, NY.

Feb. 17, 2005 "Community Air Pollution Aspects Of The Demolition Of 9-11 Contaminated Buildings". Testimony before the Committee On Lower Manhattan Redevelopment, New York City Council, New York City, NY.

Oct. 19, 2005 Air Pollution Health Effects: Consideration of Mixtures. Fall Meeting of the Mid-Atlantic Chapter of the Society of Toxicology (MASOT), East Brunswick, NJ.

Dec. 7, 2006 Asthma and Air Pollution Effects in the South Bronx. New York City Child Health Forum, The Children's health Fund, Harlem, NYC, NY.

Jan. 18, 2007 Air Pollution Effects in New York City. NYU Environmental Sciences Seminar Lecture, Washington Square, NYC, NY.

Jan. 23, 2007 The South Bronx Backpack Study: Asthma and Air Pollution in NYC. Presented at the forum "High Asthma Rates in the Bronx: What Science Now Knows and Needs to Learn." New York Academy of Sciences, 7 World Trade Center, NYC, NY.

Oct. 2, 2009 "Diesel Air Pollution and Asthma in New York City". Brown Superfund Research Program. <http://www.brown.edu/Research/SRP/thurston%20oct%202.pdf>, Brown University, Providence, RI.

June 19, 2012 “The Backpack Study of Asthma and Diesel Air Pollution in the South Bronx”. Region 1 U.S. EPA, Citizen Science Workshop, New York City, NY.

National Presentations

Oct. 20, 1987. NIEHS Symposium on the Health Effects of Acid Aerosols: “Re-examination of London, England, Mortality in Relation to Exposure to Acidic Aerosols During 1963-1972 Winters” RTP, NC.

Aug. 13, 1991 “Kuwait Mortality Risks from SO₂ and Particles: Insights from the London Fogs” The Kuwait Oil Fires Conf., American Academy of Arts and Sciences, Cambridge, MA.

Jan. 24, 1994 “Air Pollution Epidemiology: Is the Model the Message?” The First Colloquium on Particulate Air Pollution and Human Morbidity and Mortality”. Beckman Center of the NAS, Irvine, CA.

May 23, 1994 “Epidemiological and Field Studies”. American Thoracic Society Annual Meeting, Boston, MA.

May 25, 1994 “Epidemiological Evidence Linking Outdoor Air Pollution and Increased Hospital Admissions for Respiratory Ailments” American Thoracic Society Annual Meeting, Boston, MA.

May 6, 1996 “Associations Between PM₁₀ & Mortality in Multiple US Cities”. Second Colloquium on Particulate Air Pollution and Health. Park City, Utah.

Sept. 5, 1996 “Particulate Matter Exposure Issues for Epidemiology” U.S. EPA Particulate Matter Workshop, RTP, NC

April 3, 1997 “Health Effects of Ambient Ozone & Particulate Matter” Air and Waste Assoc. Regional Conference On Impacts of EPA’s Proposed Changes to Ozone and PM Standards, Oak Brook, IL

April 22, 1998 “The New EPA Standards for Ambient PM and Ozone” American Lung Association Annual Meeting, Chicago, IL.

Dec. 21, 1999 “Global Overview of Human Death and Illness due to Air Pollution”. California Air Resources, Sacramento, CA.

March 24, 2000 “Estimating Ancillary Impacts, Benefits and Costs Of Proposed GHG Mitigation Policies For Public Health” Resources for the Future, Wash., DC.

June 24, 2002 “Investigations Into the Environmental Health Impacts Related to the WTC Disaster” Air And Waste Management Annual Meeting, Baltimore, MD.

July 15, 2002 “Air Pollution and Human Health” NIEHS Built Environment Conference, RTP, NC

July 26, 2002 “The Human Health Effects of Power Plant Emissions and Associated Air Pollution”, The Environment & Health Forum, Physicians for Social Responsibility, Washington, DC.

October 7, 2002 “Community Exposures to Particulate Matter Air Pollution from the World Trade Center Disaster” Plenary Speaker at the American Association for Aerosol Research, Charlottesville, North Carolina.

Nov. 11, 2002 “Characterization of Community Exposures to World Trade Center Disaster Airborne and Settled Dust Particulate Matter Air Pollution”, American Public Health Association Annual Meeting, Philadelphia, PA.

Dec. 5, 2002 “Susceptibility of Older Adults to Air Pollution”, EPA Workshop on Differential Susceptibility of Older People to Environmental Hazards. National Academy of Sciences, Washington, DC.

Feb. 3, 2003 “Health Effects of Particulate Matter Air Pollution”, National Air Quality Conference, U.S. EPA, San Antonio, Texas

May 17, 2003 “Assessing the Influence of Particle Sources and Characteristics on Adverse Health Effects of PM”, PG18 - New Tools to Evaluate the Health Effects of Air Pollution in Epidemiologic Studies. American Thoracic Society Annual Meeting, Seattle, WA.

- Sep. 10, 2003 "Nature and impact of World Trade Center Disaster fine particulate matter air pollution at a site in Lower Manhattan after September 11." Annual Meeting of the American Chemical Society, New York, NY.
- October 20, 2003 "Translating Air Pollution Risks to the Community" Annual Meeting of the NIEHS Center Directors, Baltimore, MD.
- May 18, 2004 "The Health Imperative for Implementation of the Clean Air Act" State and Territorial Air Pollution Program Administrators/ Association of Local Air Pollution Control Officials (STAPPA/ALAPCO) National Conference, Point Clear, Alabama.
- Oct. 18, 2004 "NIEHS Centers' Investigations of the World Trade Center Collapse Pollution Exposures and Effects: A Public Health Collaboration" National Institute of Environmental Health Sciences Center Directors' Meeting, Research Triangle Park, NC.
- May 25, 2005 "Human Health Effects Associated with Sulfate Aerosols", American Thoracic Society Annual Meeting, San Diego, CA
- Oct. 24, 2005 "The Science Behind the Particulate Matter (PM) Standards" State and Territorial Air Pollution Program Administrators/ Association of Local Air Pollution Control Officials (STAPPA/ALAPCO) National Conference, Alexandria, Virginia.
- Oct. 14, 2008 "Diesel Air Pollution and Asthma Exacerbations in a Group of Children with Asthma" Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Pasadena, California.
- Feb. 26, 2010 "What studies are appropriate to use to estimate health impacts from specific sources such as diesel PM?" CARB Symposium: "Estimating Premature Deaths from Long-term Exposure to PM_{2.5}". Sacramento, CA.
- May 6, 2011 "Lung Cancer Risks from Exposure to Fine Particle Air Pollution" NYU Cancer Institute Symposium: "Cancer and the Environment", NYC, NY.
- May 16, 2012 "The Human Health Effects of Air Pollution" The Air We Breathe: Regional Summit on Asthma and Environment at Allegheny General Hospital, Pittsburgh, PA.
- June 20, 2013 "Particles in our Air: A Global Health Risk", Northeastern University, Research Seminar. Boston, MA.

International Presentations

- May 1, 1987 "Acid Aerosols: Their Origins, Occurrence, and Possible Health Effects", Canadian Environmental Health Directorate Seminar, Health and Welfare Canada, Ottawa, Canada
- July 2, 1987 "Health Effects of Air Pollution in the US", University of Sao Paulo, Sao Paulo, Brasil
- Feb. 5, 1991 "Results from the Analysis of Toronto Summer Sulfate and Aerosol and Acidity Data", Workshop on Current Use and Future Directions of Hospital-Based Data in the Assessment of the Effects of Ambient Air Pollution on Human Health. Health and Welfare Canada, Ottawa, Canada.
- April 23, 1997 "An Evaluation of the Role of Acid Aerosols in Particulate Matter Health Effects", Conference on the Health Effects of Particulate Matter in Ambient Air. Air & Waste Management Association, Prague, Czech Republic.
- May 12, 1998 "The Health Effects of PM and Ozone Air Pollution", Air Pollution: Effects on Ontario's Health and Environment. Ontario Medical Association, Toronto, Canada
- Nov. 1, 1999 "Climate Change and the Health Impacts of Air Pollution". The Public Health Opportunities and Hazards of Global Warming Workshop at the U.N. Framework Convention on Climate Change, Conference of Parties (COP5), Bonn, Germany.
- August 31, 2000 "Particulate Matter Air Pollution and Health in three Northeastern Cities", World Congress on Lung Health, Florence, Italy
- January 29, 2001 "PM Exposure Assessment and Epidemiology", NERAM International Colloquia: Health and Air Quality: Interpreting Science for Decision Makers. Ottawa, Canada.

- Feb. 4-5, 2002: "Air Pollution Exposure Assessment Approaches in U.S. Long-Term Health Studies", Workshop on Exposure Assessment in Studies on the Chronic Effects of Long-term Exposure to Air Pollution, World Health Organization, Bonn, Germany
- May 2, 2002 "Health Effects of Sulfate Air Pollution" Air Pollution as a Climate Forcing Workshop, East-West Center, Honolulu, Hawaii
- Sept. 24, 2003 "Identification and Characterization of World Trade Center Disaster Fine Particulate Matter Air Pollution at a Site in Lower Manhattan Following September 11." Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Perth, Australia.
- Dec. 1, 2003 "Terrorism and the Pulmonary Effects of the World Trade Center Disaster Particulate Matter Air Pollution", British Thoracic Society, London, England.
- Sept 14, 2005 "Results And Implications of The Workshop on the Source Apportionment of PM Health Effects", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Johannesburg, South Africa.
- Sept. 4, 2006 "A Source Apportionment of U.S. Fine Particulate Matter Pollution for Health Effects Analysis", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Paris, France.
- Sept. 4, 2007 "Applying Attributable Risk Methods to Identify Susceptible Subpopulations", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Mexico City, Mexico.
- Aug. 27, 2009 "Ischemic Heart Disease Mortality Associations with Long-Term Exposure to PM_{2.5} Components", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Dublin, Ireland.
- Dec. 1, 2010 "The Hidden Air Quality Health Benefits of Climate Change Mitigation". The Energy and Resources Institute (TERI), Lodhi Road, New Delhi, India.
- July 17, 2012 "Recent Findings on the Mechanisms and Health Risks of Particulate Matter Air Pollution", European Centre for Environment & Human Health, Truro, England.
- Aug. 29, 2012 "Health Effects of PM Components: NYU NPACT Epidemiology Results and their Integration with Toxicology Results", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Columbia, SC.
- May 20, 2013 "Long-term PM_{2.5} Exposure and Mortality in the NIH-AARP Cohort", Annual Meeting of the American Thoracic Society (ATS). Philadelphia, PA.
- Oct. 27, 2013 "Human Health Effects and Global Implications of Particle Air Pollution", Center of Excellence in Exposure Science and Environ. Health, Technion University, Haifa, Israel.

Scientific Meeting Sessions Chaired

- May 1, 1996 "Epidemiological Findings", 2nd Colloquium on Particulate Air Pollution & Health. Park City, UT.
- May 14, 1996 "Particulate Toxicity", American Thoracic Society Annual Meeting, New Orleans, LA.
- Jan. 30, 1998 "Evaluation of PM Measurement Methods". PM_{2.5}: A Fine Particulate Standard Specialty Conference. Los Angeles, CA.
- August 18, 1998 "Communities and Airports: How to Co-Exist?", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Boston, MA.
- April 28, 1998 "Clean Air Act Update", American Thoracic Society Annual Meeting, Chicago, IL.
- Oct. 21, 1998 "Health Effects and Regulatory Issues in PM", Particulate Methodology Workshop, U.S. EPA Center, for Statistics and the Env., Univ. of Washington, Seattle, WA.
- April 26, 1999 "Pulmonary Smoking and Air Pollution Epidemiology." American Thoracic Society Annual Meeting, San Diego, CA
- Sept. 6, 1999 "Personal exposures to Gases and Particles", Annual Conference of the International Society for Environmental Epidemiology (ISEE), Athens, Greece.

- March 31, 2000 "Epidemiology: Particles, Co-pollutants & Morbidity and Mortality", Workshop on Inhaled Environmental/Occupational Irritants and Allergens: Mechanisms of Cardiovascular Responses, American Thoracic Society, Scottsdale, AZ
- Jan. 26, 2000 "Epidemiology of Particulate Matter Air Pollution", PM2000 Specialty Conference, Air & Waste Management Assoc., Charleston, SC
- May 8, 2000 "Outdoor Air Pollution: Epidemiologic Studies", American Thoracic Society Annual Meeting, Toronto, Canada
- Sept. 5, 2001 "Mortality Epidemiology Studies", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Garmisch, Germany.
- May 20, 2002 "After September 11: Bio-terrorism and The Environmental Health Aftermath of The World Trade Center Disaster", Plenary Session. American Thoracic Society Annual Meeting, Atlanta, GA.
- April 1, 2003 "Epidemiology: Short-Term and Long-Term Health Effects", Conference on Particulate Matter: Atmospheric Sciences, Exposure, and the Fourth Colloquium on PM and Human Health, Pittsburgh, PA
- May 19, 2003 "Particulate Air Pollution and Diseases in Adults", American Thoracic Society Annual Meeting, Seattle, WA.
- May 21, 2003 "Air Pollution as a Cause of Childhood Asthma and Chronic Airway Disease", American Thoracic Society Annual Meeting, Seattle, WA.
- Sept. 2003 "Unexplained Medical Symptoms", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Perth, Australia.
- Sept. 25, 2005 "Technology and Health", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Johannesburg, South Africa.
- June 22, 2006 "Characteristics of PM and Related Considerations", Annual Meeting of the Air and Waste Management Association, New Orleans, LA.
- Sept. 3, 2006 "Air Pollution Mechanisms", Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Paris, France.
- Sept. 20, 2006 "Linkage and Analysis of Air Quality and Health Data", EPA & CDC Symposium on Air Pollution Exposure and Health, RTP, NC
- Sept. 5, 2007 "Radiation Exposures and Health Risks", 2007 Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Mexico City, Mexico
- Aug. 26, 2009 "Exploring the Range of Methodological Approaches Available for Environmental Epidemiology." 2009 Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Dublin, Ireland
- March 23, 2010 "Exposure to and Health Effects of Traffic Pollution", 2010 American Association for Aerosol Research Conference on Air Pollution and Health, San Diego, CA.
- Sept. 16, 2011 "Susceptibility to Air Pollution", 2011 Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Barcelona, Spain.
- Aug. 27, 2012 "Source Apportionment Of Outdoor Air Pollution: Searching For Culprits". 2012 Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Columbia, SC.
- Aug. 21, 2013 "Source-specific health effects of air pollution". 2013 Annual Meeting of the International Society for Environmental Epidemiology (ISEE). Basel, Switzerland.

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Invited Journal Editorials

- Thurston GD and Bates DM, Air Pollution as an Underappreciated Cause of Asthma Symptoms, 2003. JAMA, 290:14, pp. 1915-1916 (2003).
- Thurston G.D. (2006). Hospital admissions and fine particulate air pollution. JAMA. Oct 25; 296(16):1966.

- Thurston G. (2007). Air pollution, human health, climate change and you. *Thorax*. 2007 Sep; 62 (9): 748-9.
- Thurston GD, Balmes JR; Particulate matter and the environmental protection agency: setting the right standard. *Environmental Health Policy Committee of the American Thoracic Society. Am J Respir Cell Mol Biol*. 2012 Dec;47(6):727-8. doi: 10.1165/rcmb.2012-0414ED.
- Thurston GD. (2013). Mitigation Policy: Health Co-Benefits. *Nature Climate Change*. Oct. (3) 863-864.

Book Chapters

- Thurston, G.D. and Leber, M. The relationship between asthma and air pollution. In: *Emergency Asthma* (ed.: B. Brenner), pp. 127-144. Marcel-Dekker, New York, NY (1999).
- Thurston, G.D. and Ito, K. Epidemiological studies of ozone exposure effects. In: *Air Pollution and Health* (ed.: S. Holgate and H. Koren). Academic Press. London. pp. 485-510 (1999).
- Chen, LC, Thurston, G, and Schlesinger, RB. Acid Aerosols as a Health Hazard. In: *Air Pollution and Health* (ed.: J. Ayres, R. Maynard, and R. Richards). Air Pollution reviews: Vol. 3. Imperial College Press. London. pp. 111-161 (2006).
- Thurston, G.D. and Wallace, L. Air Pollution: Outdoor and Indoor Sources. In: *Environmental and Occupational Medicine*, 4th Edition (Eds.: W. Rom and S. Markowitz). Lippincott, Williams, and Wilkins, Philadelphia (2006).
- Thurston, G.D. Air Pollution. In: *Encyclopedia of Public Health* (ed. K. Heggenhougen) Elsevier Press. (2007).
- Thurston, G.D and Bell, M. Aerosols, global climate, and the human health co-benefits of climate change mitigation. In *Aerosol Handbook* (2nd edition) (eds.: Lev S. Ruzer and Naomi H. Harley). CRC Press (2012).
- Thurston, G. and Bell, M. The Human Health Co-benefits of Air Quality Improvements Associated with Climate Change Mitigation. In. *Global Climate Change and Public Health* (eds. Kent E. Pinkerton and William N. Rom). Humana Press (2013).

National Academy Committee Books Co-Authored

- National Research Council (NRC), *Waste Incineration & Public Health*. Committee on Health Effects of Waste Incineration. Board on Environmental Studies and Toxicology. National Academy Press, Washington, DC (2000).

International Reports Co-Authored

- Health Canada, *Health and Environmental Impact Assessment Panel Report*, "Joint Industry/Government Study: Sulfur in Gasoline and Diesel Fuels". Ottawa, Canada. (1997).
- World Health Organization (WHO), *Exposure assessment in studies on the chronic effects of long-term exposure to air pollution*. Report EUR/03/5039759. Geneva, Switzerland (2003).

Peer Reviewed Journal Articles/Letters

- Thurston, G.D. General Discussion: Atmospheric dispersion modeling - A critical review. *J. Air Pollut. Control Assoc*. 29: 939 (1979).
- Thurston, G.D. Discussion of multivariate analysis of particulate sulfate and other air quality variables by principal components - part I. Annual data from Los Angeles and New York. *Atmos. Environ*. 15: 424-425 (1981).
- Thurston, G.D., J.D. Spengler and P.J. Samson. An assessment of the relationship between regional pollution transport and trace elements using wind trajectory analysis. *Receptor Models Applied to Contemporary Pollution Problems*, Ed. E. Frederick, Air Pollution Control Association, Pittsburgh, PA (1982).

- Spengler, J.D. and G.D. Thurston. Mass and elemental composition of fine and coarse particles in six U.S. cities. *J. Air Poll. Control Assoc.* 33: 1162-1171 (1983).
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- Thurston, G.D. and J.D. Spengler. A quantitative assessment of source contributions to inhalable particulate matter in metropolitan Boston, Massachusetts. *Atmos. Environ.* 19: 9-25 (1985).
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CERTIFICATION FOR ECF PLEADING

I hereby certify with respect to the foregoing that all required privacy redactions have been made; that if required to file hard copies with the clerk's office, the ECF submission is an exact copy of those documents; and that the ECF submission was scanned for viruses with Kapersky Endpoint Security 10 for Windows, version 10.2.1.23(a) (last updated July 14, 2014), and according to the program is free of viruses.

Respectfully submitted July 14, 2014.

s/ Katherine K. O'Brien

CERTIFICATE OF SERVICE

I certify that on this 14th day of July, 2014, I electronically filed the foregoing DECLARATION OF DR. GEORGE D. THURSTON IN OPPOSITION TO MOTIONS TO STAY with the Clerk of the Court for the United States Court of Appeals for the Tenth Circuit by using the appellate CM/ECF system, which will send notification of this filing to all attorneys of record.

s/ Katherine K. O'Brien